



CMR Engineering College

Affiliated to JNTU, Hyderabad and Approved by AICTE-New Delhi

**Department of Electronics and Communication
Engineering**

**LAB IMPROVEMENT PROGRAM
FOR FUTURE TRENDS (LIFT)
MANUAL
(A.Y:2018-19-II SEM)**

A Guide for execution of Lab Courses

VISION OF THE INSTITUTE:

To be recognized as a premier institution in offering value based and futuristic quality technical education to meet the technological needs of the society.

MISSION OF THE INSTITUTE:

- To impart value based quality technical education through innovative teaching and learning methods.
- To continuously produce employable technical graduates with advanced skills to meet the current and future technological needs of the society.
- To prepare the graduates for higher learning with emphasis on academic and industrial research.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VISION

To promote excellence in technical education and scientific research in electronics and communication engineering for the benefit of society.

MISSION

- To impart excellent technical education with state of art facilities inculcating values and lifelong learning attitude.
- To develop core competence in our students imbibing professional ethics and team spirit.
- To encourage research benefiting society through higher learning.

PROGRAMMES EDUCATIONAL OBJECTIVES

- PEO 1: Excel in professional career & higher education in Electronics & Communication Engineering and allied fields through rigorous quality education.
- PEO 2: Exhibit professionalism, ethical attitude, communication skills, team work in their profession and adapt to current trends by engaging in lifelong learning.

- PEO 3: Solve real life problems relating to Electronics & Communication Engineering for the benefits of society.

PROGRAM OUTCOMES (POs)

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, social, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

LAB IMPROVEMENT FOR FUTURE TRENDS PROGRAMME (LIFT)

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GUIDELINES FOR LAB IMPROVEMENT FOR FUTURE TRENDS

(LIFT PROGRAMME)

I. Aim of the Lift Programme:

The main aim of the Lift programme in laboratory is to innovate, modify the existing facilities in labs, to create awareness among the students and develop Industry –Institution interactions and reach the standards in laboratories.

II. Functions of the Lift Programme:

- (i) To create better understanding among all the staff and lab staff / technicians about the concepts of Lift and other lab related activities.
- (ii) To Prepare Gap Analysis: This involves collection of requirements from each Lab of every department, information about expansion of labs, repairs and maintenance of labs etc.
- (v) To arrange Industrial Visits: A lab and lift related industrial visit will be organized in a year for II or III year students and a report is to be submitted by all the students who visited that particular industry.
- (vi) A report on Smart (Shadow) Engineering: This involves arrangement of Industrial practical learning, submission of Industrial visit report, Technical Survey reports and Market Survey of a product for development in laboratories.
- (vii) Verification of all the laboratories in every department by Lift Team along with the Principal and Concerned HODs to check whether the activities are going according to Lift guidelines, record keeping, Lab Manuals and Viva sessions etc.
- (viii) Check for LEAD Experiments and its follow up
- (ix) Submission of proposals related to R&D, Project and Consultancy from lab staff to Principal Sir for further approvals.

LAB IMPROVEMENT FOR FUTURE TRENDS PROGRAMME (LIFT CONCEPT)

1. OBJECTIVES AND RELEVANCE:

The main aim of the Lift programme in laboratory is to innovate, modify the existing facilities in labs, to create awareness among the students and develop Industry Institution interactions and reach the standards in laboratories.

2. SCOPE:

The main scope of the Lift lab course is to cover all the experiments as per the schedule given in the prescribed week wise periods. With this, a student can better understand the concepts and operating systems so that he could be able to get better knowledge about each lab.

3. PREREQUISITES:

The basic level idea related to each experiment should be provided to the students before conducting main lab course Following details are to be explained related to experiment:

- a. Introduction to experiment – 30 min
- b. Operating of the equipment/instrument/software
- c. Record of Experimental results.
- d. Sample Calculations / Executable Programmers

4. SYLLABUS AS PER JNTUH:

The lab course should be planned as per the JNTUH syllabus. In this, LEAD experiments should also be included in cycle of experiments.

5. GUIDELINES FOR LEAD EXPERIMENT:

- a. A LEAD Experiment is selected apart from all the other experiments that covered in JNTUH Syllabus.
- b. This experiment is exclusively new idea with the background from the rest of the experiments that continuously running in each laboratory.
- c. LEAD experiment should utilize the existing resources within the laboratory itself.
- d. Every student should aware of LEAD Experiment and he involved in doing and knowing about the experimental technique.
- e. A separate page is provided to record LEAD experiment in record book stating all details like Aim, Procedure and Record of Results.
- f. A LEAD experiment should be a unique one from all the other experiments.

- g. Each Lab Staff / Technicians must clearly explain all the students about the concept of LEAD Experiment and make them understand before going to that Experiment.

6. VIRTUAL LAB EXPERIMENT

The Virtual Laboratory is an interactive environment for creating and conducting simulated experiments: a playground for experimentation. To enthuse students to conduct experiments by arousing their curiosity. This would help them in learning basic and advanced concepts through remote experimentation.

7. SUGGESTED BOOKS:

The suggested books should be recommended to the students as per the JNTUH syllabus prescribed.

8. WEBSITES (USEFUL LINKS):

The useful links should be provided to the students, where they can get easily accessing the knowledge of the experiment.

9. EXPERT DETAILS:

The expert details should be provided based on the experimental importance.

10. a. LAB SCHEDULE

The lab schedule should be provided to the students before coming to lab. They will know the next experiments to be conducted for that batch.

b. VIVA SCHEDULES:

An exclusive viva will be conducted for all the students to test their knowledge, ability to pick up from the experimental techniques, skill development in laboratories. This viva will be organized depending upon sessions schedule in each lab.

c. SCHEME OF EVALUATION

The students will know the individual marks evaluation for internal and external lab exams.

11. PROJECT/PRODUCT/PAPER BASED LEARNING

Proposal of project with extended abstract, Block Diagram / Circuit / Flow diagram and Clear references may be presented and executed.

(or)

A product of utility may be proposed to develop for in house usage / industrial requirements may be useful for any outside agency that can be marketable in order to generate revenue through consultancy.

(or)

An article/white paper from a magazine /journal/weekly/any periodical in the entitled Subject

12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D:

The lab course should be designed in such a way that it should meet the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: Project Design & Execution.

Proposal 2: R& D Level Project Design & Execution.

Proposal 3: Consultancy Task / Project Design & Development.

a. PROPOSAL FOR R & D ACTIVITY:

1. An exact paper from a National / International journal in this entitled area / subject / area (IEEE Format)

AND/OR

2. An article / white paper from a magazine / journal / weekly / any periodical in the entitled Subject.

AND/OR

3. An Advanced technology development / proposal / article publication from any source of information.

b. PROPOSAL FOR PROJECT ACTIVITY:

A Proposal of a hobby/mini/proto/general/model/proto type project with extended abstract, Block Diagram/Circuit/Flow diagram and clear references may be presented and executed.

GUIDELINES FOR HOBBY/INCUBATION ACTIVITY:

A. A Hobby project/activity is necessary for staff as well as the students to improve Ones individual skills in laboratory work.

B. This Project consists of selecting the suitable innovation in existing theory or Practical with each lab and suggest for proposals within the scope of the organization.

C. After proposals are subjected to preliminary acceptance, then final proposals and budgeting will be started out.

D. In view of this hobby project, a proposal is made jointly either from students or both Students and staff and submit abstract along with block or flow diagram stating the applications and suitability in lab. This project will be sent for further approvals.

c. PROPOSAL FOR CONSULTANCY:

A programme / machine / product of utility may be proposed to develop for in house usage / industrial requirements may be useful for any outside agency that can be marketable in order to generate revenue through consultancy.

13. GUIDELINES FOR SHADOW ENGINEERING(VIP)

INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING ROGRAM):

OBJECTIVES OF SHADOW ENGINEERING:

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future Assignment.
4. This program leads to matrixing with the students.

PROPOSALS (WEEK WISE INDUSTRIAL VISITS) (IN HOUSE OR OUTSIDE VISIT)/TRAINING PROGRAMMES:

TABLE 1: INDUSTRIAL VISITS

| S.No | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | Remarks |
|------|------------------|--------------------|---------------|------------------------------|-------------|---------|
| | | | | | | |
| | | | | | | |

TABLE 2: INDUSTRIAL TRAINING (Smart Engg)
(Career Visit Approval)

| S.no | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/Certificate No. | Remarks |
|------|--------------------|--------------------|----------------------|-----------|----------------------------------|---------|
| | | | | | | |
| | | | | | | |

14. ACTIVITIES IN LIFT PROGRAM

CALIBRATION/INSTALLATION AND TESTING:

Calibration: Aim of this concept is to check:

- i. Whether all the equipment is functioning correctly as per the standards.
- ii. To bring correctness in the errors of instrument or equipment.
- iii. To rectify the errors if any.

Installation: Aim of this concept is to make and maintain installation procedure for a new equipment or already existing equipment

Testing : Aim of this concept is to test the equipment after installation whether it meets the existing standards.

After calibration the details of equipment should be submitted in following format:

| S.no | Type of equipment | Certificate no | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|------|-------------------|----------------|-----------------------|---------------------|-------------------------|---------|
| | | | | | | |
| | | | | | | |

15. MAINTAINANCE AND TROUBLE SHOOTING SCHEDULES:

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.

S.No, Equipment Name, Type of Problem (Too much Noise, Abnormal Sound, Corrupt Software, Anti Virus Problem, Missing of Display, CRT not working, Motor is not giving signal, Digital display is not working, Break of tools, Misalignment of machine elements, PLC is not properly working),

Expected Reasons (Bearing failure, Improper alignment of machine centers, Missing of vibration pads etc)

Trouble shooting exercises should be properly recorded in a separate format as mentioned below:

| S.No. | Date of recording activity | Equipment Name | Type of Trouble | Remedial Activity | Remarks |
|-------|----------------------------|----------------|-----------------|-------------------|---------|
| | | | | | |
| | | | | | |
| | | | | | |

16. Laboratory Additional Activity Coverage

A. Learn Emerging Advancements in the Domain (LEAD) Experiments:

| Sl.No. | Activity | Date of Coverage | Sign. Of Faculty | Remarks |
|--------|----------|------------------|------------------|---------|
| | | | | |
| | | | | |
| | | | | |

B. Trouble shooting Activity :

| Sl.No. | Activity | Date of Coverage | Sign. Of Faculty | Remarks |
|--------|----------|------------------|------------------|---------|
| | | | | |
| | | | | |
| | | | | |

C. Calibration / Testing / Installation Activity :

| Sl.No. | Activity | Date of Coverage | Sign. Of Faculty | Remarks |
|--------|----------|------------------|------------------|---------|
| | | | | |
| | | | | |
| | | | | |

D. Project / Consultancy /R&D Activity (if any):

| Sl.No. | Activity | Date of Coverage | Sign. Of Faculty | Remarks |
|---------------|-----------------|-------------------------|-------------------------|----------------|
| | | | | |
| | | | | |
| | | | | |

NAME OF THE LABORATORIES

| S.NO | YEAR-SEM | NAME OF THE LAB |
|-------------|----------------------------|---|
| 1. | II B.TECH – II SEM | ANALOG ELECTRONICS |
| 2. | II B.TECH – II SEM | ANALOG COMMUNICATIONS |
| 3. | II B.TECH – II SEM | PULSE AND DIGITAL CIRCUITS |
| 4. | III B.TECH – II SEM | DIGITAL SIGNAL PROCESSING |
| 5. | III B.TECH – I ISEM | MICRO PROCESSORS AND MICRO CONTROLLERS |

NAME OF THE SUBJECT: ANALOG ELECTRONICS

CONTENTS:

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- 13. GUIDELINES FOR SHADOW ENGINEERING AND INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM)**
- 14. ACTIVITIES IN LIFT PROGRAM**
- 15. MAINTAINANCE AND TROUBLESHOOTING**
- 16. ASSESSMENT AND ACCREDITATION PROCESDURE AS PER NABL**

1.OBJECTIVES AND RELEVANCE

The main objective of the lab course is to gain practical hands on experience by exposing the students to understand the basic working principle of electronic circuits and to specify various Amplifiers, Linear wave shaping circuits and identify the signals. To investigate, test and verify characteristics of clippers & clampers circuits , amplifiers and oscillators. Learn operating principle of electronic circuits like amplifier, oscillator, switching circuits, wave shaping circuits and multivibrators.

2.SCOPE

Understanding of Electronic circuits & Pulse Circuits Lab has the scope to make the learner comfortable to work in the area of and also to implement various projects like monitoring and controlling applications. Industries involved in design and fabrication of circuits, embedded systems, electronic equipments etc have also provide large scale placements for engineers with this specialization. Installation and maintenance of electronic equipments used for health care in hospitals, equipments & systems for instrumentation and control in process industries automation systems of assembly line in production industries, etc are also handled by electronics engineers.

3.PREREQUISITES

The prerequisites for this lab are electronic devices, transistor configurations, Applications of Transistors and basic classifications of amplifiers

4.SYLLABUS-JNTU

EXPERIMENT NO. 1

OBJECTIVE

To design and analyze Common Emitter Amplifier.

PREREQUISITE

1. Study the operation and working principle of CE amplifier.
2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim tool (Schematic & Circuit File).
4. In this lab you will use “decibels”, or dB. This is a dimensionless ratio, in logarithmic form.

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. Observe the Ac Analysis and draw the magnitude response curve.
- d. Calculate the bandwidth of the amplifier.

VIVA QUESTIONS

1. Why the CE amplifier provides a phase reversal?
2. In the dc equivalent circuit of an amplifier, how are capacitors treated?
3. What is the effect of bypass capacitor on frequency response?
4. Define lower and upper cutoff frequencies for an amplifier.
5. State the reason for fall in gain at low and high frequencies.
6. What is meant by unity gain frequency?
7. Define Bel and Decibel.
8. What do we represent gain in decibels?
9. Why do you plot the frequency response curve on a semi-log paper?
10. Explain the function of emitter bypass capacitor CE?

EXPERIMENT NO. 2

OBJECTIVE

To design and analyze the Common Source Amplifier.

PREREQUISITE

1. Study the operation and working principle of CS amplifier.
2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim (Schematic & Circuit File).

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. Observe the Transient response, Ac Analysis and draw the magnitude response curve.
- d. Calculate the bandwidth of the amplifier.

VIVA QUESTIONS

1. What is the difference between FET and BJT?
2. FET is unipolar or bipolar?
3. Draw the symbol of FET?
4. What are the applications of FET?
5. FET is voltage controlled or current controlled?

EXPERIMENT NO. 3

OBJECTIVE

To design and analyze Two stage RC Coupled Amplifier.

PREREQUISITE

1. Study the purpose of using multistage amplifiers.
2. Learn the different types of coupling methods.
3. Study the effect of cascading on Bandwidth.
4. Identify all the formulae you will need in this Lab.
5. Study the procedure of using Multisim tool (Schematic & Circuit File).

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. observe the Transient response and Ac Analysis for the first stage and second stage Separately and draw the magnitude response curve
- d. Calculate the bandwidth of the amplifier.

VIVA QUESTIONS

1. What are the advantages and disadvantages of multi-stage amplifiers?
2. Why gain falls at HF and LF?
3. Why the gain remains constant at MF?
4. Explain the function of emitter bypass capacitor, C_e ?
5. How the band width will effect as more number of stages are cascaded?
6. Define frequency response?
7. Give the formula for effective lower cut-off frequency, when N-number of stages are cascaded.
8. Explain the effect of coupling capacitors and inter-electrode capacitances on overall gain.
9. By how many times effective upper cut-off frequency will be reduced, if three identical stages are cascaded?
10. Mention the applications of two-stage RC-coupled amplifiers.

EXPERIMENT NO. 4

OBJECTIVE

To design and analyze Current shunt feedback Amplifier and Voltage series feedback amplifier.

PREREQUISITE

1. Study the operation and working principle of Current shunt and voltage series feedback amplifier.

2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim tool (Schematic & Circuit File).

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. Rig up the circuit using multisim software and verify the results using Oscilloscope
- d. Rig up the circuit using multisim software and verify the results using AC Analysis
- e. Rig up the circuit using multisim soft ware and verify the results using Parameter Sweep.

VIVA QUESTIONS

1. What is feedback in Amplifiers?
2. Explain the terms feedback factor and open loop gain.
3. What are the types of feedback?
4. Explain the term negative feedback in amplifiers?
5. What are the disadvantages of negative feedback?
6. What are the advantages of negative feedback?
7. When will a negative feedback amplifier circuit be unstable?
8. Compare the negative feedback and Positive feedback.
9. Give the expression for closed loop gain for a negative feedback amplifier?
10. How does negative feedback reduce distortion in an amplifier?
11. How does series feedback different from shunt feedback?
12. What is the difference between voltage feedback and current feedback?

EXPERIMENT NO. 5

OBJECTIVE

To design and analyze Cascode Amplifier.

PREREQUISITE

1. Study the operation and working principle of CE and CB amplifier.
2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim tool (Schematic & Circuit File).

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.

- c. Observe the Ac Analysis and draw the magnitude response curve for CE-CB.
- d. Calculate the bandwidth of the amplifiers.

VIVA QUESTIONS

1. what is cascode configuration?
2. State the reason for fall in gain at low and high frequencies.
3. What is meant by unity gain frequency?
4. Define Bel and Decibel.

EXPERIMENT NO. 6

OBJECTIVE

To design and analyze RC Phase shift oscillator using Transistor

PREREQUISITE

1. Study the different types of oscillator and their conditions.
2. Identify all the formulae you will need in this Lab.

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. Make the connections using wire and check the connections and oscillator.
- d. Go for simulation and using Run Key observe the output waveforms on CRO
- e. Observe the Transient Response and Calculate the Frequency of the oscillator

VIVA QUESTIONS

1. What are the conditions of oscillations?
2. Give the formula for frequency of oscillations?
3. What is the total phase shift produced by RC ladder network?
4. What are the types of oscillators?
5. What is the gain of RC phase shift oscillator?

EXPERIMENT NO. 7

OBJECTIVE

To design and analyze Class-A Power Amplifier (transformer less)

PREREQUISITE

1. Study the operation and working principle class-A power amplifier.
2. Identify all the formulae you will need in this Lab.

3. Study the procedure of using Multisim tool (Schematic & Circuit File).

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. Make the connections using wire and check the connections of power supply and oscillator.
- d. Go for simulation using run key and observe the output waveforms on oscillator.
- e. Indicate the node names and go for AC analysis with output node.
- f. Observe the AC analysis and draw the magnitude and phase response curves.
- g. Calculate the bandwidth of the amplifier.

Bandwidth $f_2 - f_1$

Where f_1 is Lower cutoff frequency

f_2 is Upper cutoff frequency

VIVA QUESTIONS

1. Differentiate between voltage amplifier and power amplifier
2. Why power amplifiers are considered as large signal amplifier?
3. When does maximum power dissipation happen in this circuit?
4. What is the maximum theoretical efficiency?
5. Sketch wave form of output current with respective input signal.
6. What are the different types of class-A power amplifiers available?
7. What is the theoretical efficiency of the transformer coupled class-A power amplifier?
8. What is difference in AC, DC load line?
9. How do you locate the Q-point?
10. What are the applications of class-A power amplifier?

EXPERIMENT NO. 8

OBJECTIVE

To design and analyze Class-B Complementary Symmetry Amplifier.

PREREQUISITE

1. Study the operation and working principle of complementary-symmetry class-B push-pull power amplifier

2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim tool (Schematic & Circuit File).

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. Make the connections using wire and check the connections of power supply and oscillator.
- d. Go for simulation using run key and observe the output waveforms on oscillator.
- e. Indicate the node names and go for AC analysis with output node.
- f. Observe the AC analysis and draw the magnitude and phase response curves.
- g. Calculate the bandwidth of the amplifier.

Bandwidth $f_2 - f_1$

Where f_1 is Lower cutoff frequency

f_2 is Upper cutoff frequency

VIVA QUESTIONS

1. Differentiate between voltage amplifier and power amplifier?
2. Explain impedance matching provided by transformer?
3. Under what condition power dissipation is maximum for transistor in this circuit?
4. What is the maximum theoretical efficiency?
5. Sketch current waveform in each transistor with respective input signal?
6. How do you test matched transistors required for this circuit with DMM?
7. What is the theoretical efficiency of the complementary stage amplifier?
8. How do you measure DC and AC output of this amplifier?
9. Is this amplifier working in class A or B?
10. How can you reduce cross over distortion?

EXPERIMENT NO. 9

OBJECTIVE

To design and analyze Common Base (BJT)/Common Gate (JFET) amplifier.

PREREQUISITE

1. Study the operation and working principle of CB amplifier.
2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim tool (Schematic & Circuit File).
4. Study the operation and working principle of CG amplifier
5. Identify all the formulae you will need in this Lab.

6. Study the procedure of using Multisim tool (Schematic & Circuit File).

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. Make the connections using wire and set oscillator (FG) frequency & amplitude.
- d. Check the connections and the specification of components value properly.
- e. Go for simulation using Run Key observe the output waveforms on CRO
- f. Indicate the node names and go for AC Analysis with the output node
- g. Observe the Ac Analysis and draw the magnitude response curve
- h. Calculate the bandwidth of the amplifier

VIVA QUESTIONS

1. Suppose the source resistance of V_{IN} is 50Ω . Will the CB amplifier perform well in Amplifying the signal from V_{IN} ? Why?
2. Why the CB amplifier is commonly used as a current buffer?
3. What is input terminal for CB AMPLIFIER?
4. What is the power gain of CB AMPLIFIER?
5. What is the nature of input impedance for CB AMPLIFIER?
6. Does any phase shift occur in CB AMPLIFIER?
7. What is the nature of output impedance of CB AMPLIFIER?
8. What is the difference between FET and BJT?
9. FET is unipolar or bipolar?
10. What are the applications of FET?
11. FET is voltage controlled or current controlled?

EXPERIMENT NO. 10

OBJECTIVE

To design and analyze Class-A Power Amplifier (with transformer Load).

PREREQUISITE

1. Study the operation and working principle of Class-A Power Amplifier (with transform coupled)
2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim tool (Schematic & Circuit File).

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. Make the connections using wire and check the connections of power supply.

- d. Go for simulation using run key and observe the output waveforms.
- e. Indicate the node names and go for AC analysis with output node.
- f. Observe the AC analysis and draw the magnitude and phase response curves.

VIVA QUESTIONS

1. what is Class-A Power Amplifier (with transform coupled)?
2. When does maximum power dissipation happen in this circuit?.
3. What is the maximum theoretical efficiency?
4. Sketch wave form of output current with respective input signal.

EXPERIMENT NO. 11

OBJECTIVE

To design and analyze Class-c Power Amplifier.

PREREQUISITE

1. Study the operation and working principle of Class-C Power amplifier?
2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim tool (Schematic & Circuit File).

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. Make the connections using wire and check the connections of power supply.
- d. Go for simulation using run key and observe the output waveforms.
- e. Indicate the node names and go for AC analysis with output node.
- f. Observe the AC analysis and draw the magnitude and phase response curves.

VIVA QUESTION

1. What is Class-C Power Amplifier?
2. When does maximum power dissipation happen in this circuit?.
3. What is the maximum theoretical efficiency?
4. Sketch wave form of output current with respective input signal.

EXPERIMENT NO. 12

OBJECTIVE

To design and analyze Single Tuned Voltage Amplifier.

PREREQUISITE

1. Study the operation and working principle of Single Tuned Voltage Amplifier.
2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim tool (Schematic & Circuit File).

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. Set the input signal amplitude in the function generator and observe an amplified voltage at the output Without distortion.
- d. By keeping input signal voltage, say at 50mV, vary the input signal frequency from 0 to 1MHz in steps as shown in tabular column and note the corresponding output voltages.

VIVA QUESTIONS

1. What is a tuned amplifier
2. Define Q-factor
3. What is selectivity?
4. Is tuned amplifier a narrow band or wide band amplifier
5. Give the applications for tuned amplifier

EXPERIMENT NO. 13

OBJECTIVE

To design and analyze Hartley & Colpitt's Oscillator.

PREREQUISITE

1. Study the operation and working principle Hartley oscillator.
2. Study the operation and working principle Colpitt's Oscillator.

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. With 0.1F capacitor and 20mH in the circuit and observe the waveform.
- d. Time period of the waveform is to be noted and frequency is to be calculated by the formula $f = 1/T$.
- e. Now fix the capacitance to 0.033 F and 0.047F and calculate the frequency and tabulate the readings as shown.
- f. Find the theoretical frequency from the formula $f = 1/2\pi\sqrt{LC}$
Where $L = L_1 + L_2 = 5mH + 5mH = 10mH$ and compare theoretical and practical values.
Colpitt's

- g. Connect $C_2 = 0.001 \mu\text{F}$ in the circuit and observe the waveform.
- h. Time period of the waveform is to be noted and frequency should be calculated by the formula $f = 1/T$
- i. Now, fix the capacitance to 0.002 F and then to 0.003 F and calculate the frequency and tabulate the reading as shown.
- j. Find theoretical frequency from the formula $f = 1/2\pi\sqrt{LC}$ Where $C = C_1C_2/C_1 + C_2$ and compare theoretical and practical values.

VIVA QUESTIONS

1. Give the difference between Hartley and colpitts oscillator.
2. Classification of oscillators.
3. Give an example for LC oscillator.
4. Which phenomenon is employed for crystal oscillator.
5. Give the applications of oscillator.
6. Define an oscillator?
7. Define barkhausen criteria
8. Which type of feedback is employed in oscillators
9. Give applications for oscillators
10. What is the condition for sustained oscillations

EXPERIMENT NO. 14

OBJECTIVE

To design and analyze the Darlington Pair.

PREREQUISITE

1. Study the operation and working principle of Darlington pair Amplifier
2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim (Schematic & Circuit File)

DESCRIPTION

- a. Introduction to experiment -30 min.
- b. Connection of experiment and its verifications.
- c. Go for simulation and using Run Key observe the output waveforms on CRO
- d. Indicate the node names and go for AC Analysis with the output node
- e. Observe the Ac Analysis and draw the magnitude response curve
- f. Calculate the bandwidth of the amplifier

VIVA QUESTIONS

1. Why do you need more than one stage of amplifiers in practical circuits?
2. What is the effect of cascading on gain and bandwidth?
3. What happens to the 3dB frequencies if the number of stages of amplifiers increases?

4. Why we use a logarithmic scale to denote voltage or power gains, instead of using the Simpler linear scale?
5. What is loading effect in multistage amplifiers?

5. LEAD EXPERIMENT

Experiment: 1 Wireless Baby Monitor

OBJECTIVE: Study and Design of Wireless baby monitor.

PREREQUISITES: Knowledge on electronic components and working of LM386 (IC1).

Description: A baby monitor can help you find peace of mind. You can now monitor your sleeping baby with this wireless baby monitor. It is a radio system used to remotely listen to sounds made by an infant. Simply place the circuit near your sleeping baby and listen through an FM receiver from any other room in the house. It can also alert you if the baby wakes up in the middle of the night.

Circuit and working:

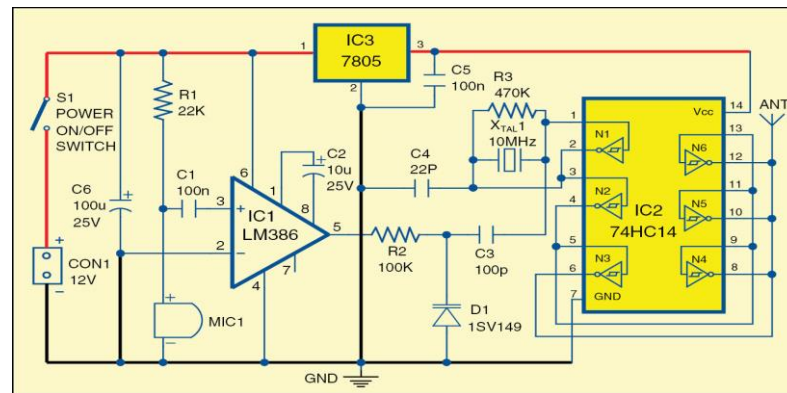


Fig. 1: Circuit diagram of the wireless baby monitor



Fig 2: Wireless baby monitor.

The circuit is built around a low-power audio amplifier using LM386 (IC1), hex inverting Schmitt trigger 74HC14 (IC2), voltage regulator 7805 (IC3), 10MHz crystal (XTAL1), varactor diode 1SV149 (D1) and a few other components. A parallel resonant oscillator circuit is formed around inverter gate N1 along with crystal (XTAL1), resistor R3, capacitors C3 and C4 and varactor diode D1. It generates square waves at the fundamental frequency of 10MHz of crystal.

The signal is buffered by gate N2 and further boosted by parallel inverter gates N3, N4, N5 and N6. Unlike sine waves, square waves have many harmonics above their fundamental frequency. The monitor transmits on tenth (100MHz) harmonics of the square wave. Use a quarter-wave 75cm piece of wire for the antenna.

The audio section of the transmitter is built around IC1. The gain is set to 200 by capacitor C2. Audio from electret microphone MIC1 is picked up and amplified by LM386. It is then coupled with varactor diode D1 via resistor R2. The crystal's frequency along with D1 forms an FM modulation signal. Since the circuit transmits on tenth harmonic of crystal frequency, audio deviation is also multiplied by a factor of 10. This results in clear audio that can be received on an FM receiver.

| PARTS LIST | |
|--|--|
| <i>Semiconductors:</i> | |
| IC1 | - LM386 low-power audio amplifier |
| IC2 | - 74HC14 hex inverting Schmitt trigger |
| IC3 | - 7805, 5V voltage regulator |
| D1 | - 1SV149 varactor diode |
| <i>Resistors (all 1/4-watt, ±5% carbon):</i> | |
| R1 | - 22-kilo-ohm |
| R2 | - 100-kilo-ohm |
| R3 | - 470-kilo-ohm |
| <i>Capacitors:</i> | |
| C1, C5 | - 100nF ceramic disk |
| C2 | - 10µF, 25V electrolytic |
| C3 | - 100pF ceramic disk |
| C4 | - 22pF ceramic disk |
| C6 | - 100µF, 25V electrolytic |
| <i>Miscellaneous:</i> | |
| CON1 | - 2-pin terminal connector |
| S1 | - On/off switch |
| MIC1 | - Electret microphone |
| X _{TAL} 1 | - 10MHz crystal |
| ANT.1 | - 75cm long wire |
| | - 12V adapter |

APPLICATIONS:-

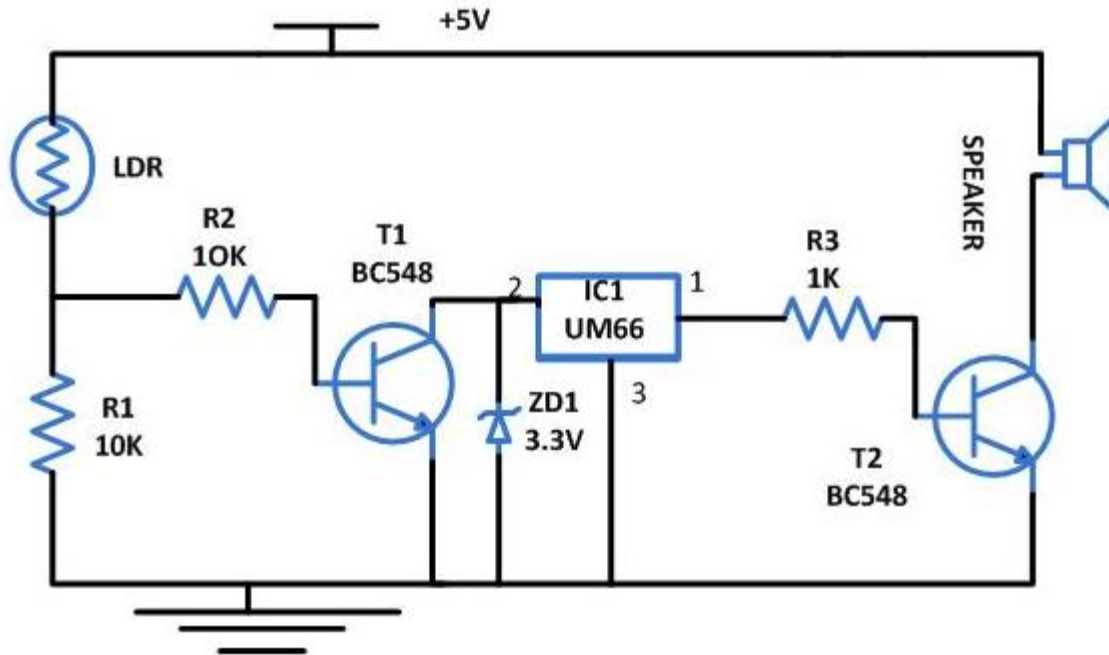
- 1) It is mostly used in houses that are having small children.

Experiment: 2 Darkness Detector Circuit

Description:

This darkness detector circuit explains the principle of operation of LDR (light dependence resistor). LDR is a device whose sensitivity depends upon the intensity of light falling on it. The resistance of LDR decreases when intensity of light falling on it increases and vice versa (resistance increases when intensity of light falling on it decreases). In dark or in absence of light, LDR exhibits a resistance in the range of mega ohms, which decreases to few hundred ohms in presence of bright light.

This phenomenon can be measured with the help of multi-meter by keeping the multi-meter in ohm or resistor measurement region. When you cover the LDR, its resistance will be very high and when you place it in light it starts decreasing. We are utilizing this property of LDR to act as a sensor, since a varying voltage drop can be obtained with varying light. In this circuit amount of light will vary as the shadow of the visitor falls on LDR. LED's should be mounted carefully.

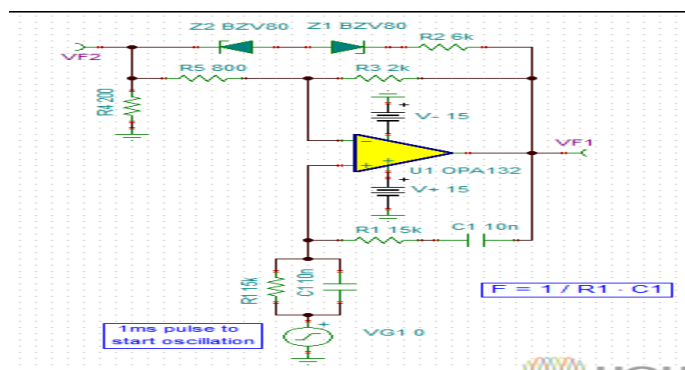


6. VIRTUAL LAB EXPERIMENT WEIN BRIDGE OSCILLATOR

Aim: To simulate and obtain the frequency response.

Apparatus: Qucs Software

Circuit Diagram:

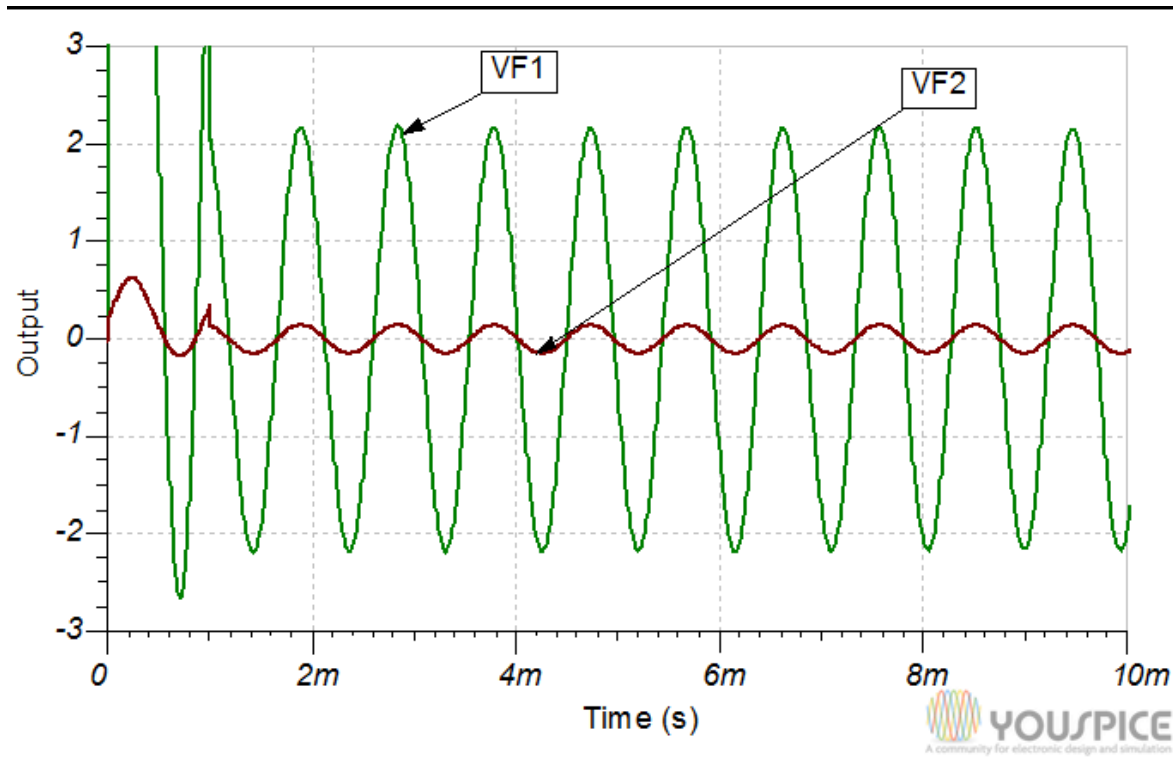


Procedure:

1. Connect the circuit as per the circuit diagram.
2. Set the properties of components as per the components properties sheet.
3. Place the transient simulation, d.c simulation and a.c simulations on editor.
4. Set the simulation properties

5. Simulate the circuit.
6. Place the cartesian diagram and set the properties.
7. Note down the the graph.

Model Graphs:



7.SUGGESTED BOOKS

1. Fundamentals of Electronic Devices and Circuits, David A. Bell 5th Ed.
2. Electronic Devices and Circuits – K. Lal Kishore, 2ed. 2005, BSP
3. Electronic Devices and Circuits – R.L Boylestad and Loius Nashelsky, 9ed, 2006, PEI/PHI
4. Millman's Electronic Devices and Circuits – J.Millman, C.C Halkias and Satyabrata , 2ed. 1998, TMH
5. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal, 1 ed., 2009, Wiley India Pvt. Ltd
6. Electronic Devices and Circuits – S. Salivahanan, N. Suresh Kumar, A. Vallavaraj, 2 ed., 2008, TMH

8. WEB SITES AND USEFUL LINKS

1. <http://www.engineersgarage.com/electronic-circuits>
2. <http://archive.org/details/ElectronicDevicesCircuits>
3. <http://www.gobokee.net/electronic-devices-and-circuits/>
4. <http://engineeringppt.blogspot.in/electronic-devices-and-circuits.html>
5. http://www.ieeeahn.org/wiki/index.php/IEEE_Electron_Devices_Society_History
6. <http://www.documbase.com/electronic-devices-and-circuits-fundamentals.pdf>
7. <http://search.edaboard.com/electronic-books.html>
8. <http://www.general-files.com/files-d/download-electronic-devices-and-circuits/8/>

9. EXPERTS' DETAILS

INTERNATIONAL

1. J. Millman ph.d and C.C.Halkias ph.d-
Associate Professor of Electrical Engineering,
Columbia University
2. Prof. Trevor J. Trarnton,
Director of Center for Solid State Electronics Research,
Arizona State University, Tempe, USA
Email:khan.tarik@asu.edu,
National
3. Dr. Balasubramanyam S K – Professor,
Department of Electronics Engineering IIT(BHU),
Varanasi.
Email:bala@bhu.ac.in
4. Dr. Banerjee Swapna,
Professor in electronics & EC engineering,
IIT Kharagpur
Email: swapna [at] ece.iitkgp.ernet.in

REGIONAL

1. P. John Paul

Dean Academics in Gurunanak Engineering College,
Hyderabad

2. K.Lal Kishore

Professor of ECE and Director of Academic and Planning,
JNTU Hyderabad

10 (A) LAB SCHEDULE:

CYCLE 1(For 30 students per session and 3 students per batch)

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 | week-8 |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|
| B1, B2 | Demo | Exp.1 | Exp.2 | Exp.10 | Exp.9 | Exp.7 | Exp.8 | Lead1 |
| B3, B4 | Demo | Exp.2 | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Lead1 |
| B5, B6 | Demo | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Lead1 |
| B7, B8 | Demo | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Exp.10 | Exp.2 | Lead1 |
| B9, B10 | Demo | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Exp.3 | Exp.10 | Lead1 |

CYCLE 2(For 30 students per session and 3 students per batch)

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 | week-8 |
|---------|--------|--------|--------|--------|--------|--------|-------------|--------|
| B1, B2 | Exp.3 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Hobby/lead2 | Test |
| B3, B4 | Exp.7 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Hobby/lead2 | Test |
| B5, B6 | Exp.3 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Hobby/lead2 | Test |
| B7, B8 | Exp.7 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Hobby/lead2 | Test |
| B9, B10 | Exp.9 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Hobby/lead2 | Test |

(B) VIVA SCHEDULE: The viva schedule should be planned prior starting to the lab experiment.

ROUND - 1(For 30 students per session and 3 students per batch)

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|-------------|--------|--------|--------|--------|--------|--------|--------|
| B1,B2,B3 | viva | | | | | | |
| B4,B5,B6 | | viva | | | | | |
| B7,B8,B9 | | | viva | | | | |
| B10,B11,B12 | | | | viva | | | |
| B13,B14,B15 | | | | | viva | | |
| B16.B17,B18 | | | | | | viva | |
| B19,B20 | | | | | | | Viva |

ROUND - 2(For 30 students per session and 3 students per batch)

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---------|--------|--------|--------|--------|--------|--------|--------|
| SG1 | Viva | | | | | | |
| SG2 | | viva | | | | | |
| SG3 | | | viva | | | | |
| SG4 | | | | Viva | | | |
| SG5 | | | | | viva | | |
| SG6 | | | | | | viva | |
| SG7 | | | | | | | Viva |

*SG: Selected Group with a maximum of 6 or 12 students

(C)SCHEME OF EVALUATION

**SCHEME OF EVALUATION OF LABS
EXTERNAL EXAM**

| S no. | Write-up (by Internal examiner) | Results (by skill assistant) | Final evaluation (Internal Examiner) | Viva (External Examiner) |
|---|---|--|--|--|
| 1 | Circuit, Equipment needed, Design, Procedure, Precautions, Tabular form, Expected graph | Based on observation, How the student is connecting the circuit, usage of equipment and typical readings | Based on correctness of the practical graph to the expected graph and results. | Based on understanding of Experiment and theoretical questions in the related subject. |
| | Marks: 30 | Marks: 15 | Marks: 15 | Marks: 15 |
| Total Marks:30+15+15+15=75 Marks | | | | |

INTERNAL LABS

| Day to Day Evaluation ----- 15 Marks | | | | | Internal Exam ---10M Marks | | |
|--------------------------------------|----------------------|---------------------------|----------------|----------------|----------------------------|----------------------|----------------|
| Uniform | Observation & Record | Performance of experiment | Result | Viva Voce | Write-up | Connections & Result | Viva Voce |
| Marks:3 | Marks:3 | Marks:3 | Marks:3 | Marks:3 | Marks:3 | Marks:3 | Marks:3 |
| Total Marks:15+10=25 Marks | | | | | | | |

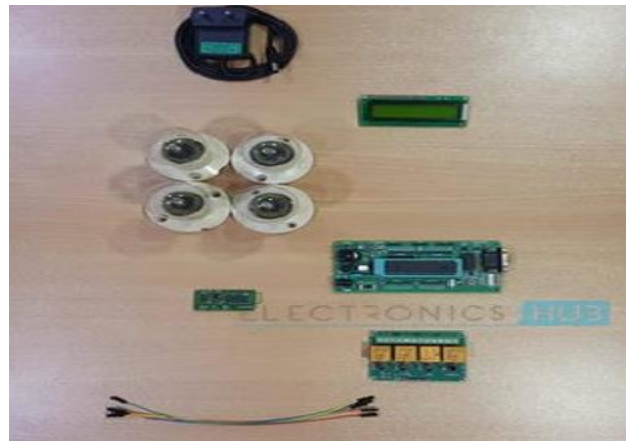
11. PROJECT/PRODUCT/PAPER BASED LEARNING

Bluetooth Controlled Electronic Home Appliances

Introduction:-

Bluetooth Controlled Electronic Home Appliances is a simple project, where we can control different electrical appliances and electronic devices using an Android device with the help of Bluetooth Technology. We have already seen how a DTMF controlled home appliances system works in the earlier post. Operating conventional wall switches is difficult for physically handicapped or elder people. This project provides the solution to this problem by integrating all the electrical appliances to a control unit that can be operated by an Android application on a device (Android smart phone or Tablet).

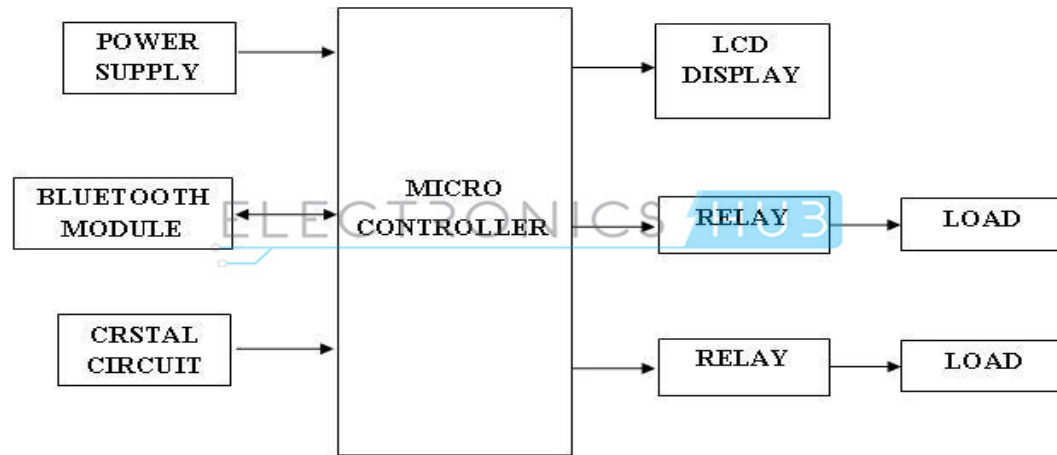
The proposed system controls the electrical loads based on the data transmitted by the Android device. An Android application should be installed in user's mobile or tablet to control the electrical loads. Using this Android application user can send the commands to the Bluetooth module to control the electrical loads. Wireless technology used in this project is Bluetooth. It can also be called as "Bluetooth Controlled Electronic Home Appliances" or "Android based Home Automation System" or "Remote Password Operated Electronic Home Appliances Control System".



Principle:-

In this project, a Bluetooth module is interfaced to 8051 Microcontroller. This Bluetooth Module receives the commands from the Android application that is installed on the Android device, using wireless communication (Bluetooth Technology). The program which is written to the 8051 microcontroller communicates with Bluetooth module serially to receive the commands. Microcontroller switches the electrical loads automatically based on the commands received from the Bluetooth.

Android Based Home Automation System Circuit Block Diagram



Components Required

Hardware Requirements

- 8051 Microcontroller (AT89C51)
- 8051 Development Board
- 8051 Programmer (Programming Board)
- Programming Cable
- 16 × 2 LCD Display
- 10K Ω Potentiometer
- Bluetooth Module (HC – 05)
- 4 – Channel Relay Module
- Loads (like Light Bulb, Fan, etc.)
- Power Supply
- Connecting wires
- If 8051 Development Board isn't available, then you might need the following
 - 10 μ F Electrolytic Capacitor
 - 2 x 10K Ω Resistors (1/4 Watt)
 - 2 x 33pF Ceramic Disc Capacitors
 - 0592 MHz Quartz Crystal
 - Push Button
 - 1K Ω x 8 Resistor Pack
- If Relay Module isn't available, then you can build the 1 – channel relay circuit (for 1 load) using the following
 - 5V or 12V Relay
 - BC547 NPN Transistor
 - 1N4007 PN Junction Diode
 - 1 K Ω Resistor (1/4 Watt)

Software Requirements

- Keil μ Vision IDE
- Willar Software
- Proteus (for Circuit Diagram and Simulation)
- Android Application installed on Android Device

Paper Based Learning:-

PSpice and project-based learning at ordinary degree level

Abstract – This paper discusses how Orcad® PSpice® simulation can be a powerful learning tool in project-based learning, contributing greatly to a successful outcome of an ordinary degree final year project. Projects should be the vehicle whereby students apply theory and practice learned in any program. However, all too often, students find projects difficult not knowing where to start the design process off on the right foot, as it were. The project chosen to illustrate project-based learning, involved four students operating in two teams, for seven hours a week over thirteen weeks, on chaotic-masking. One team had to simulate, build and test, a system for transmitting data, whilst the other team had to investigate the receiver end of things. Here, the chaos signal alters the modulating signal (the information), applied to an amplitude modulator- a process called chaotic-masking, for the purposes of obtaining a secure transmission link. In this method, data added to a chaotic signal forms a composite signal that amplitude-modulates a carrier.

12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D

The lab course should be designed in such a way that it should meet the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: Project Design & Execution

Proposal 2: R& D Level Project Design & Execution

Proposal 3: Consultancy Task / Project Design & Development

PROPOSAL FOR R & D ACTIVITY:

Experiment: 1

Water level indicator with display

Description: To understand the working of circuit one must know the truth table of 7408 and 7404 IC. 7408 IC gives you output as high or logic one when both the inputs are high otherwise we will receive low output. Quad input AND gate has four independent AND gates on a single IC. Similarly 7404 is an inverter IC which will give you high output when low input is applied and vice versa. Inverter IC has 6 independent NOT gates present on a single IC.

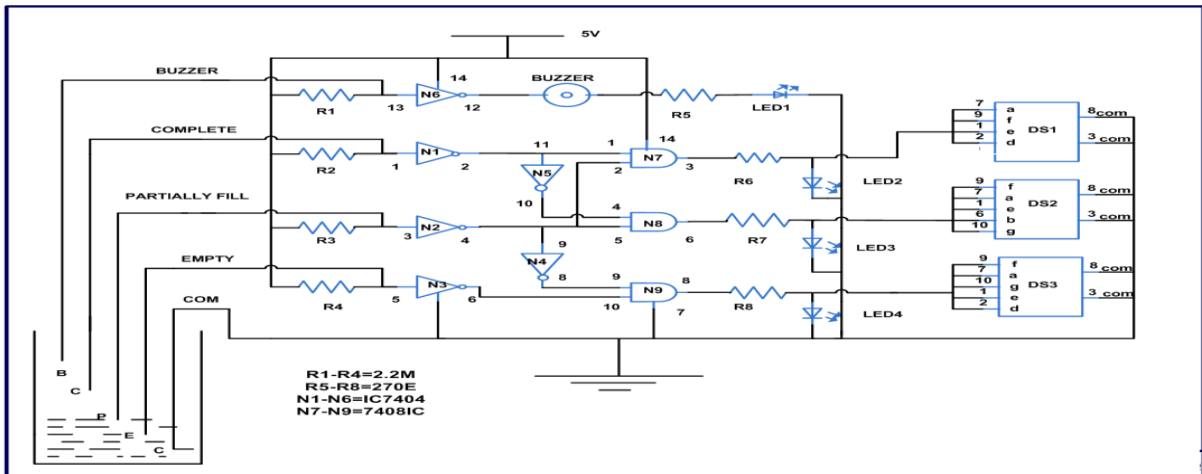
In this circuit, we are using 5 sensors to sense the level of water (one for Ground or Com, one for E, one for P, one for C and one for the buzzer). From the circuit diagram you can see that initially all input pins of 7404 IC are connected to supply with the help of 2.2Mohm resistor. Now consider the case when tank is empty: input pin 5 of IC 7404 is low as it is touching with the com sensor. This will make the output pin 6 high which is supplied to input pin 10 of gate N9 high. Pin 9 of gate N9 is

also high because input pin 3 of gate N2 is high (connected to supply with the help of resistor). This makes pin 4 of gate N2 low and pin 8 of gate N4 becomes high. Hence, we will receive a high at output pin 8 which will in switch on the LED and display. On 7 segment display, we will get the alphabet E to empty.

When water reaches at the mid or partially filled level, pin 3 of gate N2 becomes low, which makes input pin 5 of gate N8 high. Pin 4 of gate N2 is also high because input pin 1 of gate N1 is high which will in turn make the output low. This low input is supplied to pin 11 of gate N5 and output pin 10 of gate N5 become high. Therefore both the pins of gate N8 are high which will glow the LED and common cathode 7 segment display. On display, we will get the alphabet P to partially fill.

Similar phenomenon happens when water reaches the completely filled level. Pin 1 of N1 becomes low which will make input pin 1 of N7 high and pin 2 of N1 also becomes high. Therefore, we will receive high at output pin 3 of gate N7 and the common cathode LED display and LED connected to it start glowing. On display we will get the alphabet C to completely fill.

When the water is completely filled, pin 13 of gate N6 goes low to make the output pin 12 high and the buzzer connected to it start sounding. All sensors must be constructed from non corrosive material.



13. GUIDELINES FOR SHADOW ENGINEERING (VIP)

INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM):

OBJECTIVES OF SHADOW ENGINEERING:

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future assignments.
4. This program leads to matrixing with the students.

TABLE 1: INDUSTRIAL VISITS

As of now no industrial visits is proposed.

| S. No | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | Remarks |
|-------|-----------------------------|-----------------------|---------------|------------------------------|-------------|---------|
| 1 | Pacific Electronics PVT LTD | Circuit Design | | 60+60 | II/ECE | 1 |
| 2 | Sun Light Electronics | Application Designers | | 60+60 | II/ECE | 2 |

**TABLE 2: INDUSTRIAL TRAINING (Shadow Engg)
(Career Visit Approval)**

| S.no | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/Certificate No. | remarks |
|------|---------------------------|---|----------------------|-------------|----------------------------------|---------|
| 1 | Basic Digital Electronics | Advanced Training Institute for Electronics and Process instrumentation | 2 Weeks | Dy Director | | |
| | | | | | | |

14. ACTIVITIES IN LIFT PROGRAMME:

CALIBRATION/INSTALLATION AND TESTING:

Calibration: Aim of this concept is to check:

- i. whether all the equipment is functioning correctly as per the standards
- ii. To bring correctness in the errors of instrument or equipment.
- iii. To rectify the errors if any

Installation: Aim of this concept is to make and maintain installation procedure for a New equipment or already existing equipment

Testing : Aim of this concept is to test the equipment after installation whether it Meets the existing standards.

The list of equipments (hardware/software) :

- Necessity of tools for development and testing
- Equipment to be calibrated
- Installation of supporting equipment if any.

PROCEDURE FOR CALIBRATION:

Any Equipment or Instrument or Gauge or Machine can be calibrated as the standard guidelines mentioned under:

1. Identify the Equipment/Instrument/Gauge/Machine which is under defective or to be calibrated or correction for error
2. Identify the type of error and estimate its frequency of variation.
3. Check with Master Standards or equipment/instrument/machine which is working correctly and meeting our requirements.
4. Estimate the frequency of deviations from normal mode.
5. If the equipment is under warranty, then inform to concerned supplier or agency who will carry out calibration.
6. If the equipment is out of warranty then we can compare the deviations and set the error rectification.
7. Generally as per the procedure, the equipment or instruments can be calibrated by the agencies and issue calibration certificate which consists of date of calibration, calibration next due date and remarks as mentioned in the following format.
8. Record and keep all the calibration certificates in safe custody.

After calibration the details of equipment should be submitted in following format.

| S.no | Type of equipment | Certificate no | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|------|--------------------------|----------------|----------------------------|---------------------|-------------------------|---------|
| 1 | Cathode ray Oscilloscope | | SS Instruments, Kukatpally | | | |
| 2 | Trainer Kits | | SS Instruments, Kukatpally | | | |

iv. Calibration, Testing and Installation details equipment wise are mentioned as follows:

Case 1: Calibration of Equipment ----- if any

Case 2: Installation of Equipment ----- if any

Case 3: Testing of Equipment ----- if any

15. MAINTAINANCE AND TROUBLESHOOTING :

Maintenance:

Maintenance and trouble shooting of each equipment in a laboratory must follow the following guidelines:

Maintenance Schedules:

(1) Preventive Maintenance Schedules of lab will be decided by lab in charge along with concerned HOD. The details of schedule should be recorded in the following template of format.

| S.No. | Name of the Equipment | Date of Maintenance | Type of Activity | Remarks |
|--------------|---------------------------------|----------------------------|---|---------------------|
| 1 | Cathode ray Oscilloscope | | Cleaning and Servicing | Working well |
| 2 | Trainer Kits | | Testing and Troubleshooting | Working OK |
| 3 | Power Supply's | | Testing and Troubleshooting | Working OK |
| 4 | Multi-meters | | Error Correction and Calibration | Working OK |

(2) Maintenance Reports duly signed by in charges as well as HODs and duly approved by Principal periodically.

TROUBLE SHOOTING SCHEDULES:

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.

S.No., Equipment Name , Type of Problem (Too much Noise, Abnormal Sound, Corrupt Software, Anti Virus Problem, Missing of Display, CRT not working, Motor is not giving signal, Digital display is not working, Break of tools, Mis alignment of machine elements, PLC is not properly working), Expected Reasons (Bearing failure, Improper alignment of machine centres, Missing of vibration pads etc)

Trouble shooting exercises should be properly recorded in a separate format as mentioned below:

| S.No. | Date of recording activity | Equipment Name | Type of Trouble | Remedial Activity | Remarks |
|--------------|-----------------------------------|---------------------------------|-------------------------------|--------------------------|----------------|
| 1 | | Cathode ray Oscilloscope | Display Problem | | |
| 2 | | Trainer Kits | Output pin not working | | |

Presently there is no new equipment is present for either testing or installations.

16. ASSESSMENT AND ACCREDITATION PROCEDURE AS PER NABL

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories)

The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

1. Preparation of methodology in each experiment
2. Preparation of Standard Operating procedure for each equipment
3. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team (CLT) headed by Principal/HOD/Dean/incharge
4. Ensure Effective environmental conditions (temperature, humidity, storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.
5. Ensure Calibration of instruments/equipment (Only NABL accredited authorized laboratories provide calibration).
6. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
7. Ensure proper implementation of all the documents, formats to be included in the lab manual.
8. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.
9. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
10. Auditors should submit the detailed report of each lab duly signed to the Principal.

11. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
12. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.
13. All the safety precautions are properly displayed in front of each lab.
14. All the Lead experiments should be maintained separately in a record /record in a separate folder.
15. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal

NAME OF THE SUBJECT: ANALOG COMMUNICATIONS LAB

CONTENTS:

- 1. OBJECTIVES AND RELEVANCE**
- 2. SCOPE**
- 3. PREREQUISITES**
- 4. SYLLABUS AS PER JNTUH**
- 5. LEAD EXPERIMENT**
- 6. VIRTUAL LAB EXPERIMENT**
- 7. SUGGESTED BOOKS**
- 8. WEBSITES (USEFUL LINKS)**
- 9. EXPERT DETAILS**
- 10. (A) LAB SCHEDULE**
(B) VIVA SCHEDULE
(C) SCHEME OF EVALUATION
- 11. PROJECT/PRODUCT/PAPER BASED LEARNING**
- 12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D PROPOSALS**
- 13. GUIDELINES FOR SHADOW ENGINEERING (VIP) AND INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM)**
- 14. ACTIVITIES IN LIFT PROGRAM**
- 15. MAINTAINANCE AND TROUBLESHOOTING**
- 16. ASSESSMENT AND ACCREDITATION PROCEDURE AS PER NABL**

1. OBJECTIVE AND RELEVANCE:

The main objective of this lab is to gain the practical hands on experience by exposing the students to various modulation and demodulations techniques. And also understanding of the concepts involved in transmission and reception of the signals in communication.

2. SCOPE

Understanding of analog communication lab has the scope to make the learner comfortable to work in the communication area and become proficient in building and testing an analog electronic circuit. This subject gives us an idea or overview to learn concepts of Digital Communication system.

3. PREREQUISITES:

Knowledge of electronic devices, electronic circuits, signals and systems and Solid state physics is required. Also the laboratory course of electronic devices and circuits should have been completed.

4. SYLLABUS AS PER JNTUH: The lab course should be planned as per the JNTUH syllabus. In this, LEAD experiments should also be included in cycle of experiments.

(A) LIST OF THE EXPERIMENTS:

1. Amplitude modulation and demodulation
2. DSB-SC Modulator & detector
3. SSB Modulator & detector
4. Frequency modulation and demodulation
5. Study of spectrum analyzer
6. Pre-emphasis and de-emphasis
7. Time division Multiplexing and De multiplexing
8. Frequency division Multiplexing and De multiplexing
9. Verification of Sampling theorem
10. Pulse amplitude modulation & Demodulation
11. pulse width modulation & Demodulation
12. pulse position modulation & Demodulation
13. AGC characteristics
14. Frequency Synthesizer
15. Phase Lock Loop

MAIN LINKAGE OF AC THEORY WITH LAB EXPERIMENTS:

UNIT-I:

EXPERIMENT 1: AMPLITUDE MODULATION AND DEMODULATION

OBJECTIVE

To generate amplitude modulated wave and determine the percentage modulation. Also demodulate the modulated wave.

PREREQUISITES

Knowledge on electronic components, signals and systems

PROCEDURE:

1. Switch on the trainer and check the o/p of carrier generator on oscilloscope.
2. Connect around 20 kHz with 2 volts A.F signal at AF i/p to the modulator circuit.
3. Connect the carrier signal at Carrier i/p of modulator circuit.
4. Observe the Modulator output signal at AM O/P spring by making necessary changes in A.F signal.
5. Vary the modulating frequency and amplitude and observe the effects on the modulated wave forms.
6. The depth of modulation can be varied using the variable knob (potentiometer) provided at A.F signal.
7. The percentage of modulation or modulation factor can be calculated using the following formulae.

$$\% \text{ of modulation} = \frac{V_{\max} - V_{\min}}{V_{\max} + V_{\min}}$$

$$\text{Modulation factor (m)} = \frac{V_{\max} - V_{\min}}{V_{\max} + V_{\min}}$$

8. Connect the output of the modulator to the input of demodulator circuit and observe the output which is same as input.

APPLICATIONS

- Used in the communication systems
- Used in radio broadcasting
- It was first used to carry audio over telephone lines.

UNIT-II:

EXPERIMENT 2: DSB-SC MODULATOR & DETECTOR

OBJECTIVE:

To generate am-double side band suppressed carrier (DSB-SC) signal.

PREREQUISITES

Knowledge on electronic components, signals and systems

PROCEDURE:

1. Switch on the trainer.
2. Connect 200Hz sine wave, and 100 KHz square wave from the Function Generators.
3. Adjust R₁ (1K linear pot). Connect your oscilloscope to the output.
4. Vary R₁ (1K) both clockwise and counter clockwise. Observe the output.
5. Disconnect the SINE input to R₁ (1K). The output should not be close to zero.
6. Increase the oscilloscope's vertical input sensitivity to measure the output voltage.
7. Set the vertical input control to 1V/cm. Connect the SINE input to R₁ (1K) and adjust
8. R₁ for maximum output without producing clipping. Measure the peak side band output voltage.

Epk sidebands = _____.

9. Calculate the carrier suppression in dB.

$$\text{dB} = - 20 \log \frac{\text{Epk sideband}}{\text{Eout carrier only}}$$

APPLICATIONS

- In TV it is used to transmit color information.
- For transmitting stereo information in FM sound broadcast at VHF.

UNIT-III:

EXPERIMENT 3: SINGLE SIDE BAND MODULATION AND DEMODULATION

OBJECTIVE

To study single side band signal generation using phase shift method and demodulation using Synchronous detector.

PREREQUISITES:

Knowledge on electronic components, signals and systems

PROCEDURE:

1. Study the circuit operation of SSB system thoroughly.
2. Observe the output of the RF generator using CRO. There are two outputs from the RF generator, one is direct output and another is 90° phase shift with the direct output. The output frequency is 100KHz and the amplitude is $\geq 0.2V_{pp}$ (potentiometers are provided to vary the output amplitude)
3. Observe the output of the AF generator using CRO. There are two outputs from the AF generator, one is direct output and another is 90° phase shift with the direct output. A switch is provided to select the required frequency (2K, 4K or 6 KHz). AGC potentiometer is provided to adjust the gain of the oscillator (or to set the output to good shape) And the amplitude is $= 10V_{pp}$ (potentiometers are provided to vary the output amplitude)
4. Measure and record the RF signal frequency using frequency counter.
5. Set the amplitudes of the RF signals to $0.1 V_{pp}$ and connect 0° phase shift signal to one balanced modulator and 90° phase shift to another balanced modulator as shown in figure.
6. Selected the required frequency (2K, 4K or 6 KHz) of the AF generator with the help of switch and adjust the AGC potentiometer until the output amplitude is $= 10V_{pp}$ (when amplitude controls are in maximum condition).
7. Measure and record the AF signals frequency using frequency using frequency counter.
8. Set the AF signal amplitudes to $8 V_{pp}$ using amplitude control and connect to the balanced modulators as shown in below figure.
9. Observe the outputs of both the balanced modulators simultaneously using Dual trace Oscilloscope, and adjust the balance control until you get the output wave forms (DSB – SC) as shown in figure.
10. To get SSB lower side band signal, connect balanced modulator outputs (DSB-SC) to subtractor.
11. Measure and record the SSB signal frequency using counter.
12. Calculate theoretical frequency of SSB (LSB) and compare it with the practical value.
 $LSB = RF \text{ frequency} - AF \text{ frequency}$
13. To get SSB upper side band signal, connect the output of the balanced modulator to the summer circuit.
14. Measure and record the SSB upper side band signal frequency using counter.
15. Calculate theoretical value of the SSB (USB) frequency and compare it with practical value.
 $USB = RF \text{ frequency} + AF \text{ frequency}$

Ex: If RF frequency is 100 KHz and AF frequency is 2 KHz

Then $USB = 100\text{KHz} + 2 \text{ KHz} = 102 \text{ KHz}$

APPLICATIONS

- It is used for Frequency division multiplexing
- It is used for long-distance voice radio transmissions

UNIT-IV:

No experiments suggested as per the JNTU syllabus. Basic introduction concepts of FM are discussed.

UNIT-V:

EXPERIMENT 4: FREQUENCY MODULATION AND DEMODULATION

OBJECTIVE

To study Frequency modulation and demodulation and to calculate Frequency deviation and Frequency index.

PREREQUISITES

Knowledge on electronic components, signals and systems

PROCEDURE:

1. Switch on the experimental board.
2. Connect Oscilloscope to the FM O/P and observe that carrier frequency at that point without any A.F input.
3. Connect around 1 KHZ with 2 volts sine wave (A.F. Signal) to the input of the frequency modulator (At AF input)
4. Now observe the frequency modulation output on the 1st channel of CRO and adjust the amplitude of the AF signal to get clear frequency modulated wave form.
5. Vary the modulating frequency (A.F signal) , and amplitude and observe the effects on the modulated wave form.
6. Connect the FM o/p to the FM i/p of De-modulator.
7. Vary the potentiometer provided in the demodulator section.
8. Observe the output at demodulation o/p on second channel of CRO.

APPLICATIONS

- FM is used at audio frequencies to synthesize sound.
- Used in telecommunications
- Used in signal processing
- Used for direct-satellite broadcasting

EXPERIMENT 5: PHASE LOCKED LOOP USING LM565

OBJECTIVE

To study phase lock loop and its capture range, lock range and free running VCO frequency.

PREREQUISITES

Knowledge on electronic components, signals and systems

DESCRIPTION

- a. Introduction to experiment – 30 min
- b. Connection of experiment and its verification.
- c. Experimental determination of results

APPLICATIONS

- Used as Frequency Divider and Multiplier
- Used for Frequency Synthesis and Angle Modulation by PLL
- Used in Modems

UNIT-VI:

EXPERIMENT 6: PRE-EMPHASIS AND DE-EMPHASIS

OBJECTIVE

To observe the effects of pre-emphasis on given input signal. And to observe the effects of de-emphasis on given input signal.

PREREQUISITES

Knowledge on electronic components, signals and systems

PROCEDURE:

1. Switch on Pre-emphasis and De-Emphasis Trainer.
2. Give the input from signal generator to AF I/P of pre- emphasis circuit. By varying the amplitude knob set the input voltage to some mill volts say(4mV,6mV,etc.,)
3. Observe the output waveform on CRO channel – 1, by connecting either 75mH or 50mH.
4. The output of pre-emphasis circuit must below the audio frequency range.
5. Connect the output of Pre-Emphasis to the I/P of De-emphasis circuit.
6. Observe the De-Emphasis output at AF O/P of De-Emphasis circuit.
7. Measure the output voltage in CRO for each frequency and note down the values.
8. Calculate the attenuation and logF Values.
9. Plot the graph between frequencies on X-axis and attenuation on Y-axis to show the emphasis curve.
10. Various values of R and C are available so that, the time constant is suitably selected depending upon the application.

APPLICATIONS

- Used in FM transmitters & receivers.

UNIT –VII:

EXPERIMENT 7: AGC CHARACTERISTICS

OBJECTIVE:

To study the AGC Characteristics

PREREQUISITES

Knowledge on electronic components, signals and systems

DESCRIPTION

- a. Introduction to experiment – 30 min.
- b. Connection of experiment and its verification.
- c. Experimental determination of results.

APPLICATIONS

- Used in AM radio receivers.
- Used in Radar.
- Used in Telephone recording.
- Used in biological.

UNIT-VIII**EXPERIMENT 8: TIME DIVISION MULTIPLEXING AND DE MULTIPLEXING****OBJECTIVE**

To Study of Time division multiplexing and de multiplexing.

PREREQUISITES

Knowledge on electronic components, signals and systems.

DESCRIPTION

- a. Introduction to experiment – 30 min.
- b. Connection of experiment and its verification.
- c. Experimental determination of results.

APPLICATIONS

- Used in The GSM telephone system.
- Used in SONET.

EXPERIMENT 9: FREQUENCY DIVISION MULTIPLEXING AND DE-MULTIPLEXING**OBJECTIVE**

To Study of frequency division multiplexing and de multiplexing.

PREREQUISITES

Knowledge on electronic components, signals and systems.

DESCRIPTION

- a. Introduction to experiment – 30 min.
- b. Connection of experiment and its verification.
- c. Experimental determination of results.

APPLICATIONS

- FDM is used by telephone systems to transmit multiple telephone calls through high capacity trunk lines.
- FDM used in television broadcasting.
- Used in communications satellites.

EXPERIMENT 10: VERIFICATION OF SAMPLING THEOREM

OBJECTIVE

To verify sampling theorem.

PREREQUISITES

Knowledge on electronic components, signals and systems.

DESCRIPTION

- a. Introduction to experiment – 30 min.
- b. Connection of experiment and its verification.
- c. Experimental determination of results.

APPLICATIONS

- Used in Analog to Digital Converters.

EXPERIMENT 11: PULSE AMPLITUDE MODULATION & DEMODULATION

OBJECTIVE

To study the PAM modulation and demodulation of PAM and observe the output waveform.

PREREQUISITES

Knowledge on electronic components, signals and systems.

DESCRIPTION

- a. Introduction to experiment – 30 min.
- b. Connection of experiment and its verification.
- c. Experimental determination of results.

APPLICATIONS

- Use in electronic drivers for LED lighting.
- Use in Ethernet.

EXPERIMENT 12: PULSE WIDTH MODULATION & DEMODULATION

OBJECTIVE

To study the Pulse Width Modulation (PWM) and Demodulation process and record the corresponding waveforms.

PREREQUISITES

Knowledge on electronic components, signals and systems.

DESCRIPTION

- a. Introduction to experiment – 30 min.
- b. Connection of experiment and its verification.
- c. Experimental determination of results.

APPLICATIONS

- Used in Telecommunications.
- PWM is also used in efficient voltage regulators.
- Used for Audio effects and amplification.

EXPERIMENT 13: PULSE POSITION MODULATION & DEMODULATION

OBJECTIVE

To study the Pulse Position Modulation (PPM) and demodulation process and record Corresponding waveforms.

PREREQUISITES

Knowledge on electronic components, signals and systems.

DESCRIPTION

- a. Introduction to experiment – 30 min.
- b. Connection of experiment and its verification.
- c. Experimental determination of results.

APPLICATIONS

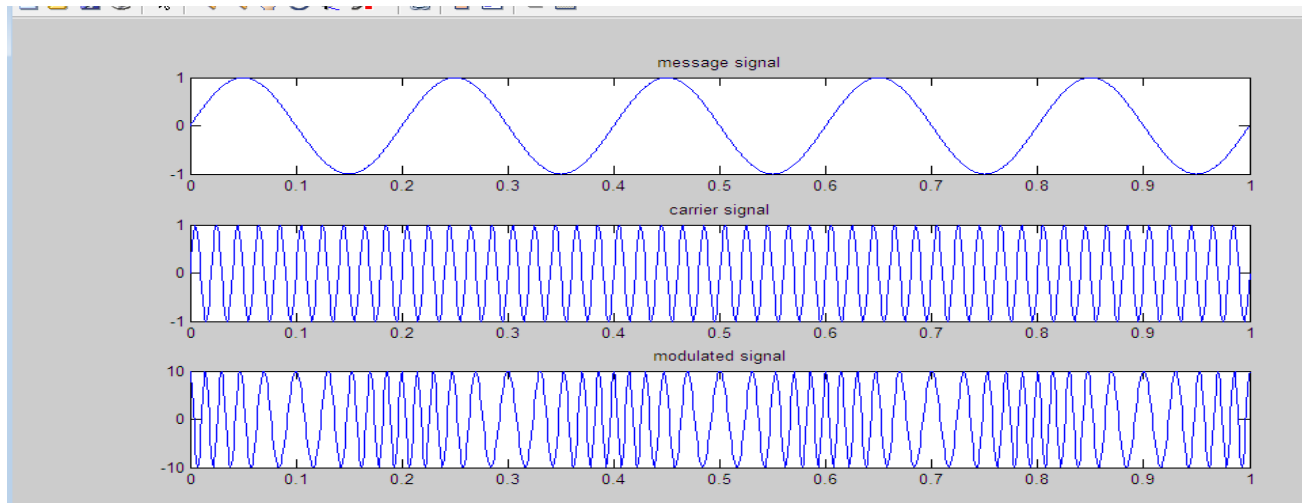
- Used specially in RF (Radio Frequency) communications.

5. LEAD EXPERIMENT

FREQUENCY SHIFT KEYING

```
clear;
clc;
b = input('Enter the Bit stream \n '); %b = [0 1 0 1 1 1 0];
n = length(b);
t = 0:0.01:n;
x = 1:1:(n+1)*100;
for i = 1:n
if (b(i) == 0)
b_p(i) = -1;
else
b_p(i) = 1;
end
for j = i:1:i+1
bw(x(i*100:(i+1)*100)) = b_p(i);
end
end
bw = bw(100:end);
wo = 2*(2*pi*t);
W = 1*(2*pi*t);
sinHt = sin(wo+W);
sinLt = sin(wo-W);
st = sin(wo+(bw).*W);
subplot(4,1,1)
plot(t,bw)
grid on ; axis([0 n -2 +2])
subplot(4,1,2)
plot(t,sinHt)
grid on ; axis([0 n -2 +2])
subplot(4,1,3)
plot(t,sinLt)
grid on ; axis([0 n -2 +2])
subplot(4,1,4)
plot(t,st)
grid on ; axis([0 n -2 +2])
Fs=1;
figure %pburg(st,10)
periodogram(st)
```

Result:



6. VIRTUAL LAB EXPERIMENT

FM FREQUENCY SPECTRUM

AIM: To generate FM frequency Spectrum the by using SCI Lab software.

Apparatus

SCILAB Software

Program:

```

fs = 1000;           // sampling frequency
delt = 1/fs;        //sampling increment
t = 0:delt:1-delt;  //time vector
N=1024              // number of points
fn = (0:N/2)*(fs/N); // frequency vector for plot
m1 = 2*cos(((2*%pi)*50)*t); // modulation signal 1

m2 = 2*cos(((2*%pi)*50)*t) + 1*cos(((2*%pi)*5)*t); //modulation signal 2

xc1 = sin((((2*%pi)*250)*t)+m1); // modulated carrier 1
xc2 = sin((((2*%pi)*250)*t)+m2); // modulated carrier 2

asxc1 = (2/N)*abs(fft(xc1)); // amplitude spectrum 1
asxc2 = (2/N)*abs(fft(xc2)); //amplitude spectrum 2

ampspec1 = asxc1(1:(N/2)+1); // positive frequency portion 1
ampspec2 = asxc2(1:(N/2)+1); // positive frequency portion 2

subplot(211)

```

```
plot2d(fn,ampspec1)
xlabel('Frequency - Hz');
ylabel('Amplitude');
subplot(212)
plot(fn, ampspec2, 'k');
xlabel('Frequency - Hz');
ylabel('Amplitude');
```

Result: Generation of FM frequency spectrum by using SCI lab software have been verified.

7. SUGGESTED BOOKS:

TEXT BOOKS:

1. Principles of Communication Systems - H Taub & D. Schilling, Gautam Sahe. TMH, 2007
3rd Edition
2. Principles of Communication Systems - Simon Haykin. John Wiley, 2r" Edition,.

REFERANCE BOOKS:

1. Electronics & Communication System - George Kennedy and Bernard Davis, 4th Edition
TMH 2009
2. Analog Communications- KN Hari Bhat & Ganesh Rao, Pearson Publications, 2nd
Edition, 2008.
3. Communication Systems Second Edition - R.P. Singh. SP Sapre, TMH, 2007
4. Communication Systems - B.P Lathi, BS Publication, 2006.

8. WEB SITES (USEFUL LINKS):

1. http://www.ece.ucf.edu/files/labs/EEL4515_LabManual.pdf
2. www.studymode.com/.../Analog-Communication-Manual-46547844
3. <http://myclassec.blogspot.in/2009/11/analog-communication-lab-Question-bank.html>
4. <http://www.ee.ic.ac.uk/naylor/notes/comms2.pdf>
5. www.scribd.com/doc/26029070/Analog-Communications-Lab
6. <http://www.youtube.com/watch?v=FksDWIkAXWM&list=PLSFM7g7ViTRJYwY9n5rWHnr9f0cBZp0QY>

9. EXPERT DETAILS

INTERNATIONAL

1. Nisha Gupta, Professor Dept of ECE, BIT Mesra,
Email: ngupta@bitmesra.ac.in
2. Salil Kumar Sanyal, Professor Dept of ECE, Jadavpur University

salil@etce.jdvu.ac.in,salil_kumars@hotmail.com

NATIONAL

1. Sreeraj Dept OF E&ECE , BITS pilani
Email: sreeraj @goa.bits-pilani.ac.in)
2. R.Gangopadhayay
Asst Professor ,Dept.of E& ECE
email: ranjan@ece.iitkgp.ernet.in

REGIONAL

1. DR.D. Srinivas,Hod Dept OF ECE JNTUH
Email:dsraoece@jntuh.ac.in
2. Ms.Swetha,Dept OF ECE, Bapatla Engineering College
Email:sweta_ece@yahoo.co.in

10. (A) LAB SCHEDULE:

The lab schedule should be planned once in a week. The week wise Scheduled experiment should be completed.

CYCLE 1 (For 30 students per session and 3 students per batch)

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 | week-8 |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|
| B1, B2 | Demo | Exp.1 | Exp.2 | Exp.10 | Exp.9 | Exp.7 | Exp.8 | Lead1 |
| B3, B4 | Demo | Exp.2 | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Lead1 |
| B5, B6 | Demo | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Lead1 |
| B7, B8 | Demo | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Exp.10 | Exp.2 | Lead1 |
| B9, B10 | Demo | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Exp.3 | Exp.10 | Lead1 |

CYCLE 2(For 30 students per session and 3 students per batch)

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 | week-8 |
|---------|--------|--------|--------|--------|--------|--------|-------------|--------|
| B1, B2 | Exp.3 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Hobby/lead2 | Test |
| B3, B4 | Exp.7 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Hobby/lead2 | Test |
| B5, B6 | Exp.3 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Hobby/lead2 | Test |
| B7, B8 | Exp.7 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Hobby/lead2 | Test |
| B9, B10 | Exp.9 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Hobby/lead2 | Test |

(B) VIVA SCHEDULE: The viva schedule should be planned prior starting to the lab experiment.

ROUND - 1(For 30 students per session and 3 students per batch)

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|-------------|--------|--------|--------|--------|--------|--------|--------|
| B1,B2,B3 | viva | | | | | | |
| B4,B5,B6 | | viva | | | | | |
| B7,B8,B9 | | | viva | | | | |
| B10,B11,B12 | | | | viva | | | |
| B13,B14,B15 | | | | | viva | | |
| B16.B17,B18 | | | | | | Viva | |
| B19,B20 | | | | | | | Viva |

ROUND - 2(For 30 students per session and 3 students per batch)

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---------|--------|--------|--------|--------|--------|--------|--------|
| SG1 | Viva | | | | | | |
| SG2 | | viva | | | | | |
| SG3 | | | Viva | | | | |
| SG4 | | | | Viva | | | |
| SG5 | | | | | viva | | |
| SG6 | | | | | | viva | |

*SG: Selected Group with a maximum of 6 or 12 students

(C). SCHEME OF EVALUATION

LAB EXTERNAL

| S no. | Write-up (by Internal examiner) | Final evaluation (Internal Examiner) | Viva (External Examiner) |
|--------------------------------------|--|--|--|
| 1 | Aim Equipment needed Circuit diagram Procedure Precautions Tabular form Expected graph | Based on observation, how the student is connecting the circuit, usage of equipment and typical readings And based on correctness of the practical graph to the expected graph and results. | Based on understanding of Experiment and theoretical questions in the related subject. |
| | Marks: 25 | Marks: 25 | Marks: 25 |
| Total Marks:25+25+25=75 Marks | | | |

LAB INTERNAL

| Day to Day Evaluation ----- 15 Marks | | | | | Internal Exam ---10M Marks | | |
|--------------------------------------|----------------------|---------------------------|---------|-----------|----------------------------|----------------------|-----------|
| Uniform | Observation & Record | Performance of experiment | Result | Viva Voce | Write-up | Connections & Result | Viva Voce |
| Marks:3 | Marks:3 | Marks:3 | Marks:3 | Marks:3 | Marks:4 | Marks:3 | Marks :3 |
| Total Marks:15+10=25 Marks | | | | | | | |

11. PROJECT/PRODUCT/PAPER BASED LEARNING

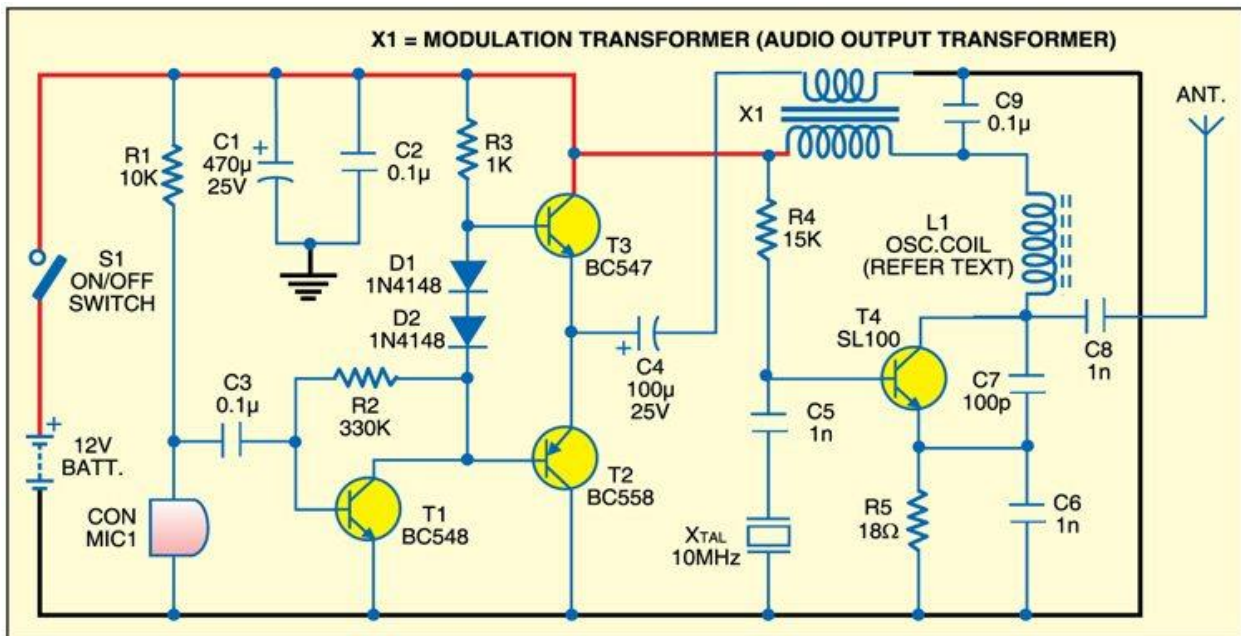
FM TRANSMITTER

OBJECTIVE: Design & Study of the Crystal AM Transmitter.

PREREQUISITES

Knowledge on electronic components, signals and systems

CIRCUIT DIAGRAM



12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D: The lab course should be designed in such a way that it should meet the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: Project Design & Execution.

Proposal 2: R& D Level Project Design & Execution.

Proposal 3: Consultancy Task / Project Design & Development

PROPOSAL FOR R & D ACTIVITY:

1. An exact paper from a National/International journal in this entitled area/subject/area (IEEE Format) AND/OR
2. An article/white paper from a magazine /journal/weekly/any periodical in the entitled subject AND/OR
3. An Advanced technology development/ proposal/article publication from any source of Information

PROPOSALS 2:

MATLAB Based PCM Modeling and Simulation

Abstract

PCM is the key technology of digital communication, and has especially been widely used in the optical fiber communication, digital microwave communication, satellite communication. Modeling PCM communication systems with the pulse code system by programming, and conduct computer simulation by MATLAB, to analysis performance of the linear PCM and logarithmic PCM.

Keywords: PCM modeling, SNR, quantitative, compression feature, simulation analysis.

PROPOSAL FOR PROJECT ACTIVITY:

1. A Proposal of a hobby/mini/proto/general/model/proto type project with extended abstract, Block Diagram/Circuit/Flow diagram and clear references may be presented and executed.

Hobby Project:

“GAIN AND NOISE CALCULATION OF CASCADED SYSTEM”

PROGRAM:

```
clc;
clear all;
close all;
x=input('No of stages,x');
%enter gain of all amplifiers in
g=input('enter gain of all amplifier sin array format:');
%enter noise figure of 1st amplifier
nf1=input ('enter noise figure of 1st amplifier:');
noisefactor=0;
```

```

gn=1;
GAIN=0;
for i=1:x
TOTAL_GAIN=GAIN+g(i);
end
for i=2:x
a=g(i-1);
b(i-1)=[a];
end
for i=1:(x-1)
b(i);
end
for i=1:(x-1)
noisefigure=input('enter noise figure of next amplifier:');
N=noisefigure-1;
gn=gn*b(i);
NF=N/gn;
noisefactor=noisefactor+NF;
end
%total noise factor of the cascaded
system is
TOTAL_NOISEFACTOR=nf1+noisefactor;
T1=input ('enter noise temp of 1st amplifier:');
noisetemp=0;
gn=1;
for i=2:x
a=g(i-1);
b(i-1)=[a];
end
for i=1:(x-1)
b(i);
end
for i=1:(x-1)
T=input('enter noise temp of next amplifier:');
gn=gn*b(i);
NT=T/gn;
noisetemp=noisetemp+NT;
end
%total noise temp of the cascaded
systemis
TOTAL_TEMPERATURE=T1+noisetemp;
%results
TOTAL_GAIN
TOTAL_NOISEFACTOR

```

RESULT:

No of stages,x3

enter gain of all amplifier sin array format:[2 3 20]

enter noise figure of 1st amplifier:1.1

enter noise figure of next amplifier:1.2

enter noise figure of next amplifier:1.3

enter noise temp of 1st amplifier:2

enter noise temp of next amplifier:3

enter noise temp of next amplifier:4

TOTAL_GAIN =

20

TOTAL_NOISEFACTOR =

1.2500

TOTAL_TEMPERATURE =

4.1667

PROPOSAL FOR CONSULTANCY:

Proposed Equipment for usage:

A program/machine/product of utility may be proposed to develop for in house usage/Industrial requirements may be useful for any outside agency that can be marketable in order to generate revenue through consultancy.

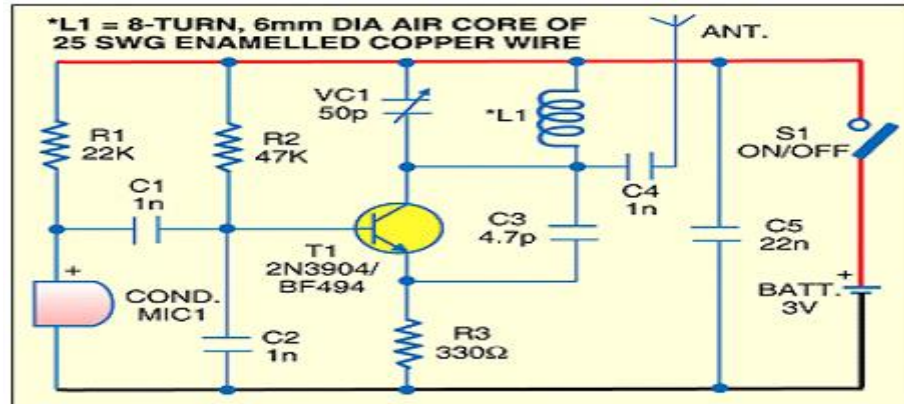
Proposal to design Listening device for hearing class room lecture from a long distance.

Proposed component for usage: single transistor 2N3904 (T1), a custom-made coil (L1), a trimmer (VC1), 22K ohm, 47K ohm,330 ohm resistors, a condenser microphone (MIC1), 50Pf,1nf,4.7pf,22nf.

FM BUG

The one thing every spy needs is a small and well concealed listening device. The FM Listening Bug Kit gives you all you need to build a small, single Transistor, FM transmitter that can operate between 80 MHz and 150 MHz. Allowing you to tune it to an open frequency on an FM Radio and listen to what is going on in the room you leave that bug in. This bug has an effective range of about 100 meters. This FM bug transmitter circuit will let you spy on people. The transmitter can be placed in the desired room and the conversation heard from a place far away just using a regular FM radio set.The circuit is designed around a single transistor 2N3904 (T1), a custom-made coil (L1),

three capacitors (C1 through C3), a trimmer (VC1), two resistors (R1 and R2) and, of course, a condenser microphone (MIC1). The circuit transmits in the frequency range of 88-105 MHz. Transmission range is 100 meters. Working of the circuit is simple and based on analogue modulation in which a carrier signal is varied corresponding to the message signal.



The microphone picks up the sounds in its vicinity to produce corresponding electrical signal. This is the message signal that needs to be transmitted over FM band. The message signal is fed to the base of transistor T1. The tank circuit made using trimmer VC1 and coil L1 generates the carrier frequency. This frequency can be tuned using the trimmer. Transistor T1 modulates the audio signal from condenser microphone over the carrier signal produced by tank circuit. This modulated signal is transmitted through the antenna (ANT). Using trimmer VC1, tune the carrier frequency in FM band and confirm it with an oscilloscope. You will hear the conversation picked up by MIC1 when you tune frequency of the FM radio set to match frequency of the carrier. Prepare the coil L1 using about 25cm length of 25SWG wire. Wrap the wire around a cylindrical object of 6mm diameter and take it out after eight turns. Assemble the circuit on a general-purpose PCB and enclose in a suitable cabinet. After proper soldering, fix switch S1 on the front side of the cabinet. Ensure that the oscillator is properly tuned. Addition of a dipole antenna will extend range of the FM bug transmitter. The circuit works off a 3V battery.

FUNDED/UNFUNDED PROPOSALS (if any):

The proposals for AICTE grants like (SDPs, RPS and MODROBES etc) UGC grants, DST PRI and other funding agencies by giving Title and abstract/objective OR Self Funded program proposals may be submitted for Management approvals.

TITLE: Seminar on Realization of Communication systems using MATLAB

OBJECTIVE: This seminar programme is intended to bring down the awareness among all Students and staff in order to study the various applications of communication systems like FM Radio, RADAR, and Television using mat lab.

13. GUIDELINES FOR SHADOW ENGINEERING (VIP) INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM):

OBJECTIVES OF SHADOW ENGINEERING:

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future assignments.
4. This program leads to matrixing with the students

PROPOSALS (WEEK WISE INDUSTRIAL VISITS) (IN HOUSE OR OUTSIDE VISIT)/TRAINING PROGRAMMES:

The following proposals are going to make

If students are visited different companies like Sulaxana circuits private limited, Doordarshan kendra etc.

TABLE 1: INDUSTRIAL VISITS

| S. No | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | Remarks |
|-------|--------------------|---|---------------|------------------------------|-------------|---------|
| 1 | Sulaxana Circuits | PCBs | | 60 | III/ECE | |
| 2 | Doordarshan Kendra | Public service broadcasting and Telecasting | | 60 | III/ECE | |

TABLE 2: INDUSTRIAL TRAINING (Shadow Engineering) (Career Visit Approval)

If students are different companies like Advanced Training Institute for Electronics and Process Instrumentation, MSME.

| S. No | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/Certificate No. | remarks |
|-------|--------------------|---|----------------------|-----------|----------------------------------|---------|
| 1 | OFC | Advanced Training Institute for Electronics and | 1 Week | GM | | |

14. ACTIVITIES IN LIFT PROGRAMME (CALIBRATION/INSTALLATION AND TESTING):

Calibration: Aim of this concept is to check:

- i. whether all the equipment is functioning correctly as per the Standards.
- ii. To bring correctness in the errors of instrument or equipment.
- iii. To rectify the errors if any.

Installation: Aim of this concept is to make and maintain installation procedure for a new equipment or already existing equipment.

Testing : Aim of this concept is to test the equipment after installation whether it meets the existing standards.

The list of equipments (hardware/software):

- (i) Necessity of tools for development and testing
- (ii) Equipment to be calibrated
- (iii) Installation of supporting equipment if any.

After calibration the details of equipment should be submitted in following format.

As all the equipments in the lab are kit based, so that calibration is not done by lab in-charge

| S.no | Type of equipment | Certificate no | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|-------------|--------------------------|-----------------------|------------------------------|----------------------------|--------------------------------|----------------|
| 1 | Spectrum Analyzer | MS/13-14/827 | Sciencetech Technologies | | | |
| 2 | CRO | 12-13/672 | Sciencetech Technologies | | | |

Procedure for Installation:

Mat lab Installation:

STEPS: Installation of MATLAB Software for window XP/VISTA / Windows 7/8

Get administrator privileges for the system on which you plan to install MATLAB.

Use WinRAR to extract RAR file

Step1: Start the installer for Windows, double-clicking on setup.exe

Step 2: Choose to Install Without Using the Internet

When it starts, the installer displays the following dialog box. Select the Install without using the Internet option and Click OK to proceed with installation.

Step 3: Review the License Agreement

Review the software licensing agreement and, if you agree to its terms, click Yes.

Step 4: Enter the File Installation Key

Enter your File Installation Key and Click OK.

Step 5: Choose the Installation Type

In the Installation Type dialog box, specify whether you want to perform a Custom Installation and click next.

Step 6: Specify the Installation Folder Specify the name of the folder where you want to install MathWorks products. Accept the default installation folder or click Browse to select a different one. If the folder doesn't exist, the installer creates it.

Step 7: Specify Products to Install (Custom Only)

Leave it by default and continue.

Step 8: Specify the Location of the License File.

Enter the full path of your License File in the text box (or drag and drop the file) and Click Next.

Step 9: Specify Installation Options (Custom Only)

After selecting installation options, click next to proceed with the installation.

Step 10: Confirm Your Choices and Begin Copying Files

Before it begins copying files to your hard disk, the installer displays a summary of your installation choices. To change a setting, click back. To proceed with the Installation, click Install. As it copies files to your hard drive, the installer displays a status dialog box to show the progress of the installation.

Step 11: Complete the Installation.

15. MAINTAINANCE AND TROUBLESHOOTING:

(A)Maintenance:

Maintenance and trouble shooting of equipment in a laboratory must follow the following guidelines:

Maintenance Schedules:

- (1) Preventive Maintenance Schedules of lab will be decided by lab in charge along with concerned HOD. The details of schedule should be recorded in the following template of format.

| S. No. | Name of the Equipment | Date of Maintenance | Type of Activity | Remarks |
|---------------|------------------------------|----------------------------|-------------------------|----------------|
| 1 | AM /FM Kit | | Checking of IC working | |

(2) Maintenance Reports duly signed by in charges as well as HODs and duly approved by Principal periodically.

(B) TROUBLE SHOOTING SCHEDULES:

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.

S. No., Equipment Name , Type of Problem (Too much Noise, Abnormal Sound, Corrupt Software, Anti Virus Problem, Missing of Display, CRT not working, Motor is not giving signal, Digital display is not working, Break of tools, Misalignment of machine elements, PLC is not properly working), Expected Reasons (Bearing failure, Improper alignment of machine centre, Missing of vibration pads etc)

Trouble shooting exercises should be properly recorded in a separate format as mentioned below:

| S. No | Date of recording activity | Equipment Name | Type of Trouble | Remedial Activity | Remarks |
|-------|----------------------------|----------------|-----------------|--|---------|
| 1 | | AM kit | Distortion | Changing the IC/ Changing the amplitude of input signals. | |

16. ASSESSMENT AND ACCREDITATION PROCEDURE AS PER NABL

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories)

The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

1. Preparation of methodology in each experiment.
2. Preparation of Standard Operating procedure for each equipment
1. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team (CLT) headed by Principal/HOD/Dean/incharge.
2. Ensure Effective environmental conditions (temperature, humidity, storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.
3. Ensure Calibration of instruments/equipment (Only NABL accredited authorized laboratories provide calibration.

4. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
5. Ensure proper implementation of all the documents, formats to be included in the lab manual.
6. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.
7. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
8. Auditors should submit the detailed report of each lab duly signed to the Principal.
9. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
10. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.
11. All the safety precautions are properly displayed in front of each lab.
12. All the Lead experiments should be maintained separately in a record /record in a separate folder.
13. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal.

NAME OF THE SUBJECT: PULSE AND DIGITAL CIRCUITS LAB

CONTENTS:

- 1. OBJECTIVES AND RELEVANCE**
- 2. SCOPE**
- 3. PREREQUISITES**
- 4. SYLLABUS AS PER JNTUH**
- 5. LEAD EXPERIMENT**
- 6. VIRTUAL LAB EXPERIMENT**
- 7. SUGGESTED BOOKS**
- 8. WEBSITES (USEFUL LINKS)**
- 9. EXPERT DETAILS**
- 10. (A)LAB SCHEDULE**
(B)VIVA SCHEDULE
(C)SCHEME OF EVALUATION
- 11. PROJECT/PRODUCT/PAPER BASED LEARNING**
- 12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D PROPOSALS**
- 13. GUIDELINES FOR SHADOW ENGINEERING (VIP) AND INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM)**
- 14. ACTIVITIES IN LIFT PROGRAM**
- 15. MAINTAINANCE AND TROUBLESHOOTING**
- 16. ASSESSMENT AND ACCREDITATION PROCEDURE AS PER NABL**

1. OBJECTIVES AND RELEVANCE

The main objective of the lab course is to gain practical hands on experience by exposing the students to familiarize with

1. Generation and processing of sinusoidal and non-sinusoidal signals.
2. Fundamentals of basic logic gates and its applications.
3. Analysis and design of various multivibrator circuits.
4. Design and analysis of UJT relaxation oscillator and boot-strap sweep circuits

2. SCOPE

Understanding of PULSE & Digital Circuits Lab has the scope to make the learner comfortable to work in the area and also to implement various projects like monitoring and controlling applications. Industries involved in design and fabrication of devices, integrated circuits, embedded systems, electronic equipments etc have also provide large scale placements for engineers with this specialization. Installation and maintenance of electronic equipments used for health care in hospitals, equipments & systems for instrumentation and control in process industries automation systems of assembly line in production industries, etc are also handled by electronics engineers.

3. PREREQUISITES

Knowledge of electronic devices, electronic circuits, signals and systems and Solid state physics is required. Also the laboratory course of electronic devices and circuits should have been completed.

4. SYLLABUS AS PER JNTUH

EXPERIMENT NO. 1

1. Linear Wave shaping

- (a)RC Low Pass Circuit for different time constants (JNTU SL.No.1)
- (b)RC High Pass Circuit for different time constants

OBJECTIVE

Design a RC Low pass Filter and High Pass Filter at various time constants and verify the responses for Square wave input

PREREQUISITES

Basic Knowledge of High Pass Filter and Low pass Filter and derivations of rise time and tilt

DESCRIPTION

- a. Introduction to experiment -30 min
- b Connection of experiment and its verifications
- c. Calculate the rise time for low pass filter and tilt for high pass filter and

- compare with the theoretical values.
- d. Graphical determination of LPF &HPF for time constants (1) $RC = T$
(2) $RC \gg T$ (3) $RC \ll T$

APPLICATIONS

1. High Pass Filter can be used as Differentiator
2. High Pass Filter can be used in Image Processing and Audio Frequency Applications
3. Low Pass Filter Can be used as Integrator
4. Used in analog to digital converters and digital filters etc

VIVA QUESTIONS:

1. When HP-RC circuit is used as Differentiator?
2. Draw the responses of HPF to step, pulse, ramp inputs?
3. Draw the responses of LPF to step, pulse, ramp inputs?
4. Define % tilt and rise time?
5. When LP-RC circuit is used as integrator?
6. Why noise immunity is more in integrator than differentiator?
7. What is the Applications of High Pass Filter?
8. What is meant by linear wave shaping?
9. Write the formula for rise time t_r ?
10. What is the Applications of Low Pass Filter?

EXPERIMENT NO. 2

2. Non Linear Wave Shaping (JNTU SL.No.2)

- (a) Transfer characteristics and response of Clippers
- (i) Positive and Negative Clippers
- (ii) Clipping at two independent levels

OBJECTIVE

To study the Positive and negative clipping circuits for different reference voltages and to verify the responses.

PREREQUISITES

Theory of Linear Wave Shaping, Working Principle of Series and Shunt Clippers and Knowledge on Transfer Characteristics

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Connection of experiment and its verifications
- c. Experimental determination of Series and Shunt Clippers.

d. Graphical determination of clippers with Transfer characteristics

APPLICATIONS

1. Clippers can be used as Slicers.
2. Used as Amplitude Limiters.
3. Series Clippers are used in Noise Limiters in FM Transmitters.
4. Clippers are also used in TV Receivers.

VIVA QUESTIONS:

1. Define clipping circuit?
2. What are the different types of clippers?
3. What is a break region?
4. Which kind of a clipper is called a slicer circuit?
5. What are the disadvantages of the shunt clipper?
6. What are the disadvantages of the series clipper?
7. What is piecewise linear mode of a diode?
8. What are the Applications of clippers?

2. Non Linear Wave Shaping (Clampers) (JNTU SL.No.2)

(b) The steady state output waveform of clampers for a square wave input

- (i) Positive and Negative Clampers
- (ii) Clamping at reference voltage

OBJECTIVE

To study the clipping circuits for different reference voltages and to verify the responses.

PREREQUISITES

Basic operation of Clamper circuits, Theory of Nonlinear Wave Shaping

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Connection of experiment and its verifications
- c. Experimental determination of Clamping Circuit for various Reference Voltages
- d. Graphical Determination of Clamping Circuits for various Reference Voltages

APPLICATIONS

1. Clampers can be used as DC Restorer or DC inserters.
2. TV Transmitters and Receivers.
3. Used in RADAR Systems

4. Computer Displays.

VIVA QUESTIONS

1. What are the applications of clamping circuits?
2. What is the synchronized clamping?
3. Why is a clamper called a dc inserter?
4. What is clamping circuit theorem. How does the modified clamping Circuit theorem differs from this?
5. Differentiate -ve clamping circuit from +ve clamping circuits in the Above circuits?
6. Describe the charging and discharging of a capacitor in each circuit?
7. What is the function of capacitor?
8. What are the effects of diode characteristics on the output of the Clamper?

EXPERIMENT NO. 3

Comparison Operation of Comparators (JNTU SL.No.3)

OBJECTIVE

To design and observe the performance of a Comparator circuit

PREREQUISITES

Working Principle of Comparator, knowledge on comparator applications

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Connection of experiment and its verifications
- c. Experimental determination of Transistor Operation by applying Square wave input.
- d. Observe the wave forms at collector and base of the transistor.

APPLICATIONS

1. Used in Comparison Applications
2. Used as Zero Crossing detectors

VIVA QUESTIONS

1. Define comparator?
2. List out the applications of comparator circuits?
3. What is the difference between comparator and clamper?

EXPERIMENT NO. 4

Switching characteristics of a transistor (JNTU SL.No.4)

OBJECTIVE

To design and observe the performance of a transistor as a switch.

PREREQUISITES

Working Principle of Transistor, knowledge on Transistor Switching Times

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Connection of experiment and its verifications
- c. Experimental determination of Transistor Operation by applying Square wave input.
- d. Observe the wave forms at collector and base of the transistor.

APPLICATIONS

1. Used in Switching Applications
2. Power Supply circuits.

VIVA QUESTIONS

1. Differentiate between Diode and Transistor as a switch?
2. Mention typical values of $V_{BE\text{ Sat}}$, $V_{CE\text{ Sat}}$ for both Si, Ge Transistors?
3. Define ON time, OFF time of the transistor?
4. In which regions Transistor acts as a switch?
5. Explain phenomenon of “ latching “ in a Transistor switch?
6. Define Rise time & fall time of a transistor switch?
7. Define Storage time of a Transistor?
8. In which region Transistor acts as a Amplifier?
9. Explain the Applications of Transistor?
10. Define Transition time of a Transistor?

EXPERIMENT NO. 5

Design a Bistable Multivibrator and draw its waveforms (JNTU SL.No.5)

OBJECTIVE

Design the Bistable Multivibrator circuit and verify the operation.

PREREQUISITES

Working principle of Bistable Multivibrator

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Connection of experiment and its verifications
- c. Observe the waveforms at V_{BE1} , V_{BE2} , V_{CE1} , V_{CE2} using CRO
- d. Graphical determination of bistable multivibrator

APPLICATIONS

1. Used as Basic Memory Element
2. Used to Perform Many Digital Operations such as counting and Storing of Binary Data.
3. Generation and Processing of Pulse type wave forms.

VIVA QUESTIONS

1. What are the applications of Bistable Multivibrator?
2. What are the another names of Bistable Multivibrator
3. What is stable state?
4. What is Quasi stable state?
5. Define what is multivibrator?
6. Compare the monostable, Bistable and Astable Multivibrator?

EXPERIMENT NO. 6

Design a Astable Multivibrator and draw its waveforms(JNTU SL.No.6)

OBJECTIVE

To design an Astable Multivibrator to generate clock pulse for a given frequency and obtain the wave forms and test its performance

PREREQUISITES

Operation of Astable Multivibrator and Applications

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Connection of experiment and its verifications
- c. Observe the waveforms at VBE1, VBE2, VCE1, VCE2 using CRO
- d. Calculation of Frequency of astable multivibrator and compare with theoretical value.

APPLICATIONS

1. Free Running Oscillator.
2. Square Wave Generator
3. Astable Multi vibrator can be used as Relaxation Oscillator.

VIVA QUESTIONS

1. What are the applications of Astable Multivibrator?
2. What are the another names of Astable Multivibrator
3. What is stable state?
4. What is Quasi stable state?
5. Define what is multivibrator?
6. Compare the monostable, Bistable and Astable Multivibrator.

EXPERIMENT NO. 7

Design a Monostable Multivibrator and draw its waveforms (JNTU SL.No.7)

OBJECTIVE

To design a monostable multivibrator to generate clock pulse for a given frequency and obtain the waveforms and test its performance.

PREREQUISITES

Operation of Monostable Multivibrator and Applications, Derivation for gate width of Monostable Multivibrator.

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Connection of experiment and its verifications
- c. Observe the waveforms at VBE1, VBE2, VCE1, VCE2 using CRO
- d. Compare the theoretical and practical gate widths

APPLICATIONS

1. Monostable Multivibrator finds extensive applications in Pulse Circuits.
2. Used as Gating Circuit or a Delay Circuit

VIVA QUESTIONS

1. What are the applications of Mono stable Multivibrator?
2. What are the another names of Mono stable Multivibrator?
3. What is stable state?
4. What is Quasi stable state?
5. Define what is multivibrator?
6. Compare the monostable, Bistable and Astable Multivibrator?

EXPERIMENT NO. 8

Response of Schmitt Trigger circuit for loop gain less than and greater than one (JNTU SL.No.8)

OBJECTIVE

To design a Schmitt Trigger circuit for loop gain less than and greater than one and test its performance

PREREQUISITES

Operation of Schmitt trigger and loop gain calculations

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Connection of experiment and its verifications
- c. Observe the waveforms at VBE1, VBE2, VCE1, VCE2 using CRO
- d. Compare the theoretical and practical gate width

APPLICATIONS

1. Amplitude comparator
2. Square Wave Generator

VIVA QUESTIONS

1. What are the applications of Schmitt trigger
2. What are the another names of Schmitt trigger
3. What is Loop gain?
4. What is UTP and LTP?
5. What is the condition to eliminate hysteresis?
6. Write the Expressions for UTP and LTP?

EXPERIMENT NO. 9

UJT relaxation oscillator

(JNTU SL.No9)

OBJECTIVE

Experimental determination of UJT as a relaxation oscillator. Determination of intrinsic Standoff ratio

PREREQUISITES

Working principle of UJT and its characteristics.

DESCRIPTION

- a. Introduction to experiment – 30 min
- b. Connection of experiment and its verification.
- c. Experimental determination of UJT characteristics and calculation of intrinsic standoff ratio.
- d. Graphical determination of UJT relaxation oscillator Characteristics

APPLICATIONS

1. Most popular application is UJT Relaxation Oscillator.
2. Timing Circuits.
3. Saw tooth wave Generators.
4. Triggering of SCR.

VIVA QUESTIONS

1. What are the applications of UJT?
2. What is intrinsic standoff ratio?

3. What is Relaxation oscillator?
4. What is another name of UJT?

EXPERIMENT NO. 10

The output – voltage waveform of Boot strap circuit

OBJECTIVE

Experimental determination of the output – voltage waveform of Boot strap circuit

PREREQUISITES

Working principle of bootstrap circuit and its characteristics, applications

DESCRIPTION

- a. Introduction to experiment – 30 min
- b. Connection of experiment and its verification.
- c. Experimental determination of output – voltage waveform of Boot strap circuit
- d. Graphical determination of output – voltage waveform of Boot strap circuit

APPLICATIONS

1. Most popular application is miller integrator circuit
2. Timing base generators.
3. CRO's, Televisions and RADAR Displays
4. Time modulation

VIVA QUESTIONS

1. Which amplifier is used in Bootstrap time base generator?
2. What type of sweep does as Bootstrap weep circuit generates?
3. What are the applications of time base generators?
4. Which feedback is used in Bootstrap sweep circuit?
5. What is the Gain of Bootstrap circuit?

EXPERIMENT NO. 11

The output – voltage waveform of Boot strap circuit

OBJECTIVE

Experimental determination of the output – voltage waveform of Miller sweep circuit

PREREQUISITES

Working principle of Miller sweep circuit and its characteristics, applications

DESCRIPTION

- a. Introduction to experiment – 30 min
- b. Connection of experiment and its verification.
- c. Experimental determination of output – voltage waveform of Miller sweep circuit
- d. Graphical determination of output – voltage waveform of Miller sweep circuit

APPLICATIONS

1. Most popular application is miller integrator circuit
2. Timing base generators.
3. CRO's, Televisions and RADAR Displays
4. Time modulation

VIVA QUESTIONS

1. Which amplifier is used in miller time base generator?
2. What type of sweep does a miller sweep circuit generate?
3. What are the applications of time base generators?
4. Which feedback is used in miller sweep circuit?
5. What is the Gain of miller circuit?

EXPERIMENT NO. 12

SAMPLING GATES

OBJECTIVE

Experimental determination of the two diode and four diode sampling gate

PREREQUISITES

Working principle of sampling gates and its characteristics, applications

DESCRIPTION

- a. Introduction to experiment – 30 min
- b. Connection of experiment and its verification.
- c. Experimental determination of output – sampling gates
- d. Graphical determination of output – sampling gates

VIVA QUESTIONS

1. Difference between sampling and logic gates?
2. Working principle of sampling gates?
3. Applications of sampling gates

5. LEAD EXPERIMENT

SYNCHRONIZATION OF A UJT RELAXATION OSCILLATOR

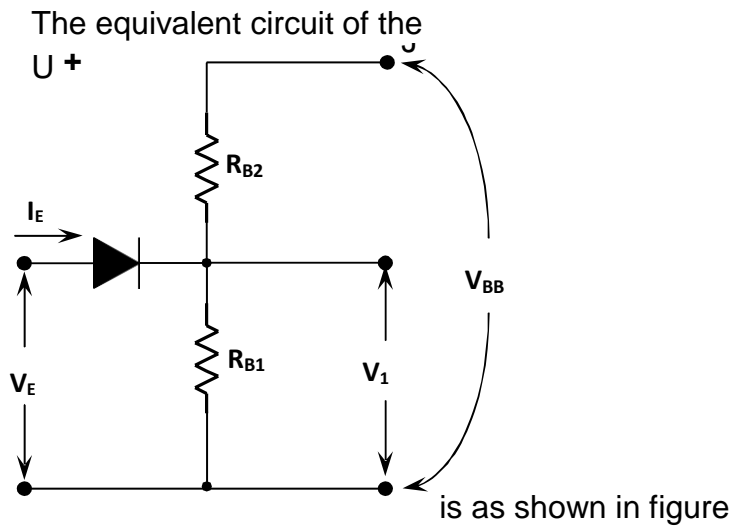
AIM : *To obtain synchronization and frequency division of a UJT relaxation oscillator by applying negative pulse at base 2 of UJT and plot the waveforms*

APPARATUS :

1. Resistors 47k Ω , 100 Ω , 330 Ω
2. Capacitor - 0.1 μ F , 10 μ F
3. 2n2646 UJT
4. Bread board
5. Power supply 0-30V
6. CRO (1Hz-20MHz)
7. Function generator (1Hz-1MHz)

THEORY

'A Unijunction transistor (UJT), as the very implies, has only one p-n junction, unlike a BJT which has two p-n junctions'.



R_{B1} is the resistance between base B_1 and the emitter, and it is basically a variable resistance, its value being dependent upon the emitter current I_E .

R_{B2} is the resistance between base B_2 and the emitter, and the value is fixed. Consider the circuit as shown in figure 1.

Let $I_E = 0$. Due to the applied voltage V_{BB} a current I results as shown.

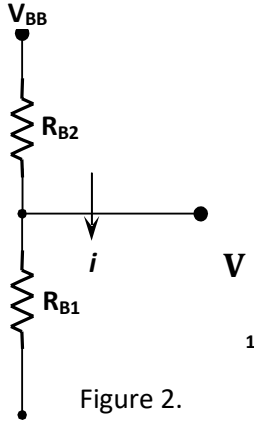


Figure 2.

We have $V_1 = iR_{B1}$.

But $i = \frac{V_{BB}}{R_{B1} + R_{B2}}$

$$V_1 = \frac{V_{BB} R_{B1}}{R_{B1} + R_{B2}}$$

$$V_1 = V_{BB} \frac{R_{B1}}{R_{B1} + R_{B2}}$$

$$\frac{V_1}{V_{BB}} = \frac{R_{B1}}{R_{B1} + R_{B2}}$$

$$\frac{V_1}{V_{BB}} = \frac{R_{B1}}{R_{B1} + R_{B2}}$$

The ratio $\frac{R_{B1}}{R_{B1} + R_{B2}}$ is termed as the **intrinsic stand off ratio** and it is denoted as α .

$$\alpha = \frac{R_{B1}}{R_{B1} + R_{B2}}$$

?? ? $\frac{R_{B1}}{R_{B1} + R_{B2}}$ when, $I_E \approx 0$?

? R_{B1} ? R_{B2} ?

Form the equivalent circuit, it is evident that the diode cannot conduct unless the emitter voltage

$V_E = V_D + V_1$, where V_D is the cut-in voltage of the diode.

This value of the emitter voltage which makes the diode conduct is termed as **peak voltage**, and it is denoted as V_P .

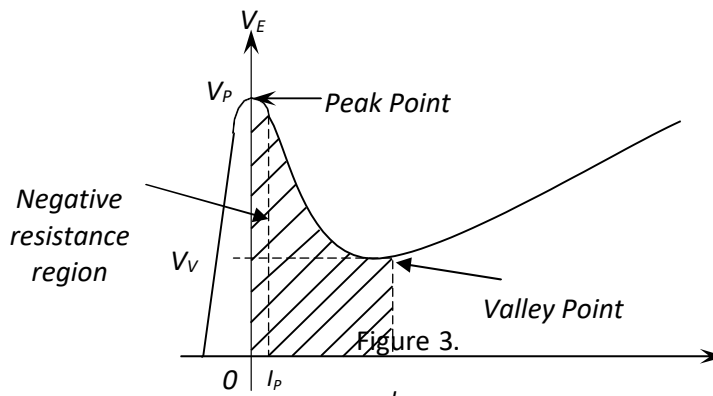
We have $V_E = V_D + V_1$,

or since $V_P = V_D + \frac{R_{B1}}{R_{B1} + R_{B2}} V_{BB}$ $V_1 = \frac{R_{B1}}{R_{B1} + R_{B2}} V_{BB}$.

It is obvious that if $V_E < V_P$, the UJT is OFF, and

if $V_E > V_P$, the UJT is ON.

Figure 3. shows the emitter characteristics of a UJT (plot of V_E vs I_E)



The main application of UJT is in switching circuits wherein rapid discharging of capacitor is very essential.

Having understood the basic of UJT, we shall next study the working of UJT relaxation oscillator.

Working of UJT relaxation oscillator (OR UJT sweep circuit)

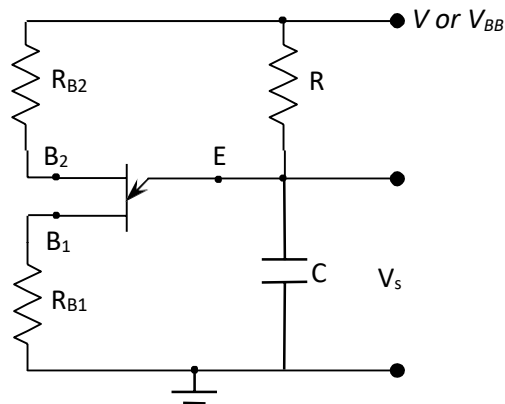


Figure:4

The UJT sweep circuit shown in the figure 4 consists of a UJT, a capacitor and a resistor arranged as shown.

We studied that a UJT is OFF as long as $V_E < V_P$, the peak voltage. Hence initially when the UJT is OFF, the capacitor C charges through the resistance R from the supply voltage V .

Let V_S = capacitor voltage.

It is seen that when the capacitor voltage V_S rises to the value V_P the UJT readily conducts. When the UJT becomes ON, the capacitor discharges and its voltage falls. When the voltage falls to the valley point V_V , the UJT becomes OFF and the capacitor charges again to V_P .

This cycle of charging and discharging of the capacitor C repeats, and as a result, a saw tooth wave form of voltage across C is generated.

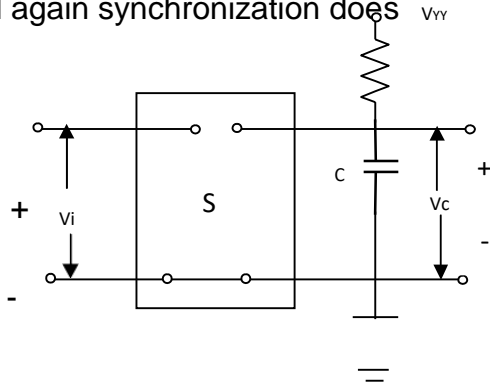
Synchronization and frequency division of UJT:

The synchronization principle of UJT is shown in fig (a) Synchronization to an external signal is possible because this signal may be introduced at the sync terminal in such a manner as to change the peak voltage V_p . Thus in the UJT a negative pulse applied at B2 as shown in fig (b) will lower V_p , whereas in the SCS, the thyristor and the thyatron a positive pulse applied at the gate, the base, or the grid will serve the same purpose. The situation which results when synchronizing pulses are applied shown in fig c. The effect of the sync pulse is to lower for the duration of the pulse, the peak or break down voltage as indicated. A pulse train of regular space is shown starting at an arbitrary time $t = 0$

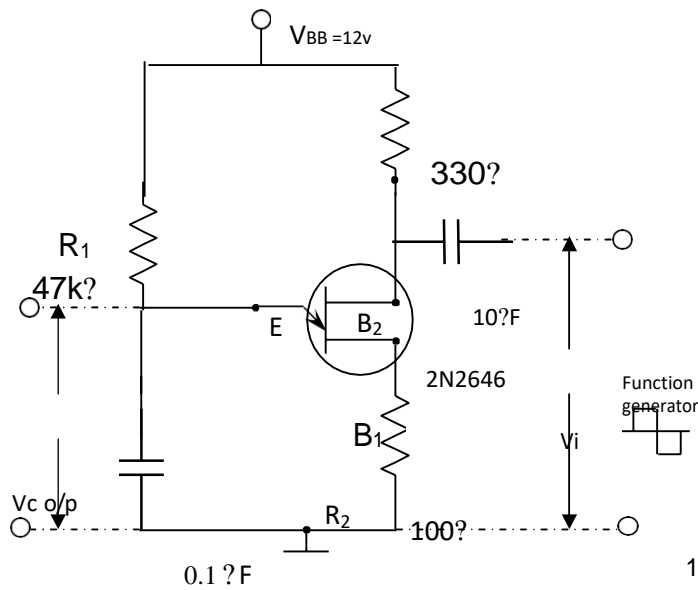
The first several pulses have no influence on the sweep generator, which continues to run unsynchronized. Eventually however the exact moment at which the negative resistance device goes ON is determined by the instant of occurrence of a pulse as is also each succeeding beginning of the ON interval. From the point on the sweep generator runs synchronously with the pulses

In order that synchronization may result, it is necessary that each pulse shall occur at a time when it may serve to terminate the cycle prematurely. This requirement means that the interval between pulses, T_p must be less than the natural period, T_o , of the sweep generator. In fig (d) the case in which $T_p > T_o$. Here synchronization of each cycle does not occur. The pulses do serve to establish that four sweep cycles shall occur during the course of 3 pulse periods, but synchronization of this type is normally of no value. Even if the requirement $T_p < T_o$ is met,

synchronization cannot result unless the pulse amplitude is at least large enough to bridge the gap between the quiescent breakdown voltage V_c . In fig (e) have the case T_p is less than T_o as required but the pulses amplitude is too small and again synchronization does not result

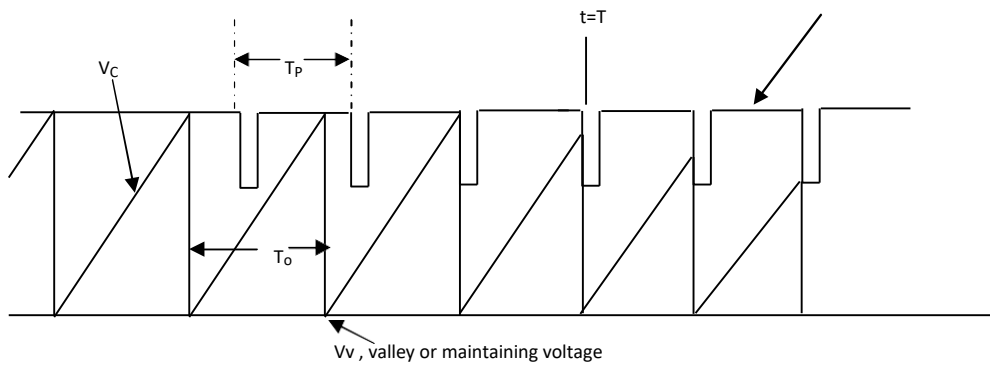


1. A sweep generator

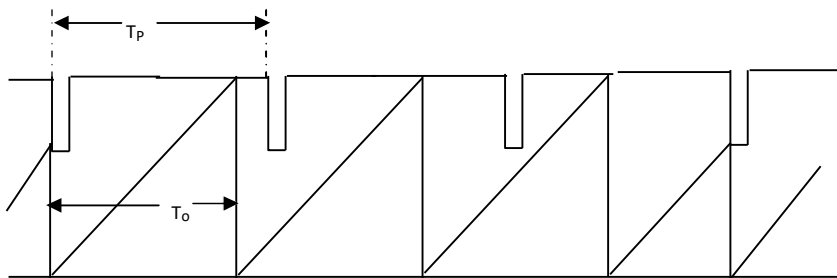


1. Emitter 2. Base1 3. Base2

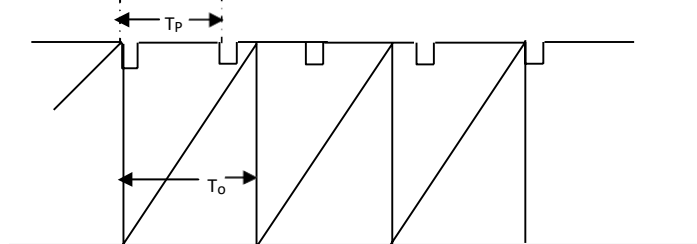
Fig (b)



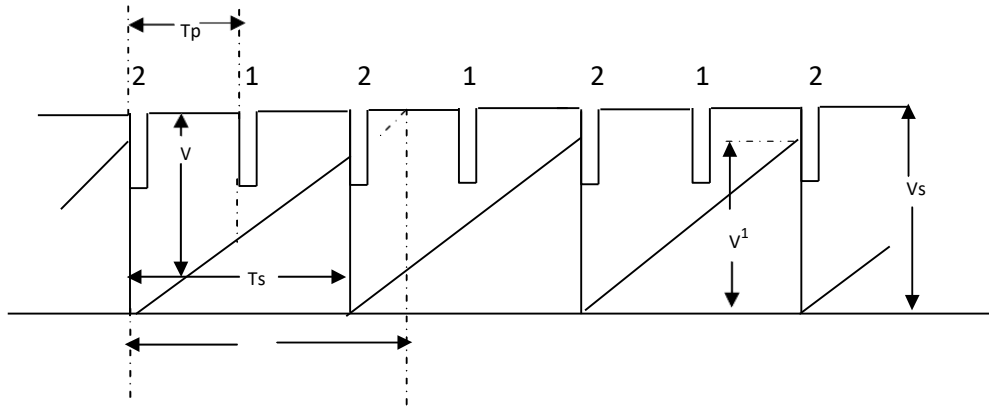
c) an initially unsynchronized generator falls into synchronization shortly after the application of synchronizing pulses



d) Illustrating that for synchronization to result, T_p must be less than T_o ;

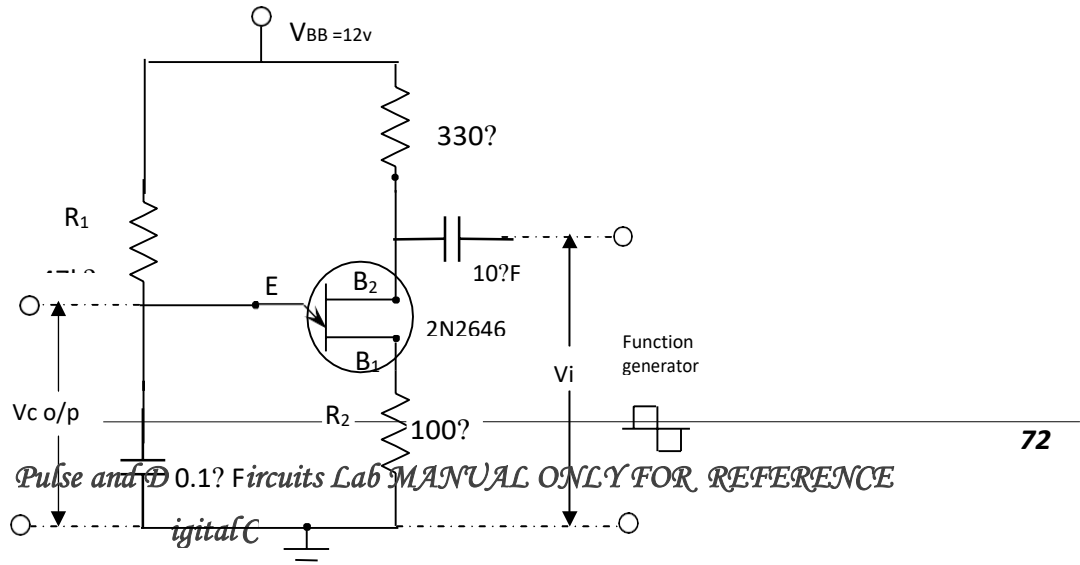


e) illustrating failure of synchronization due to inadequate amplitude of sync pulses



f) frequency division by a factor of 2 in a sweep generator

CIRCUIT DIAGRAM



PROCEDURE:

1. Connect the circuit as shown in circuit diagram
2. Note down the voltage V_s and time period T_o across the capacitor 'c' without giving external sync pulses
3. Now apply external negative sync pulses to the Base2 of UJT
4. Now adjust the amplitude and time period T_p in such a way $T_p < T_o$ of the sync pulses until synchronization is achieved
5. Now note down the sweep voltage V_s and time period if the sweep wave form across capacitor 'c'
6. Now adjust the Amplitude and Time period T_p is such a way $T_p \ll T_o$ to achieve frequency division of 2:1, 3:1, 4:1.

QUESTIONS:

1. Describe some important applications of a UJT?

2. Is the name UJT appropriate?
3. Write short notes on UJT as a relaxation oscillator?
4. Discuss the concept of $-ve$ resistance?
5. Define the intrinsic stand off ratio and explain its importance?
6. Explain how synchronization is achieved using UJT?
7. What are the conditions to achieve frequency division using UJT?

Conclusion:

Conclusions can be made on what are the conditions required to achieve for the synchronization and frequency division using UJT sweep generator

6. VIRTUAL LAB EXPERIMENT

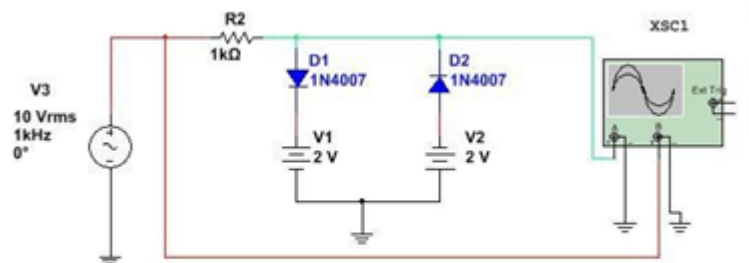
Clippers and Clamper

AIM: To design and verify the operation of clipper and clamper circuits using simulation software.

APPARATUS REQUIRED: PC loaded with MULTISIM software.

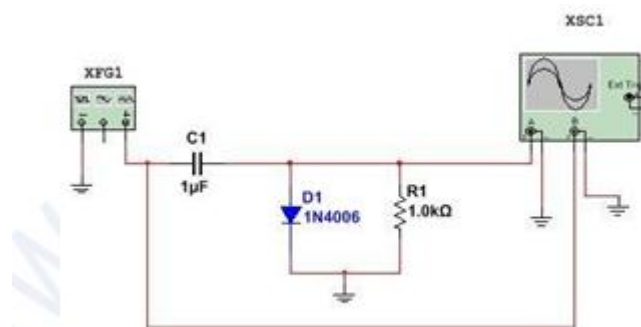
CIRCUIT DIAGRAM:

Two way parallel clipper with reference voltage:

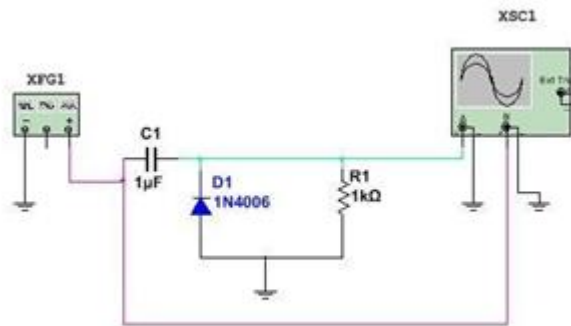


Set Frequency range: $F=10$ KHz and 10V.

Positive Clamper :



Negative Clamper:



SIMULATION PROCEDURE

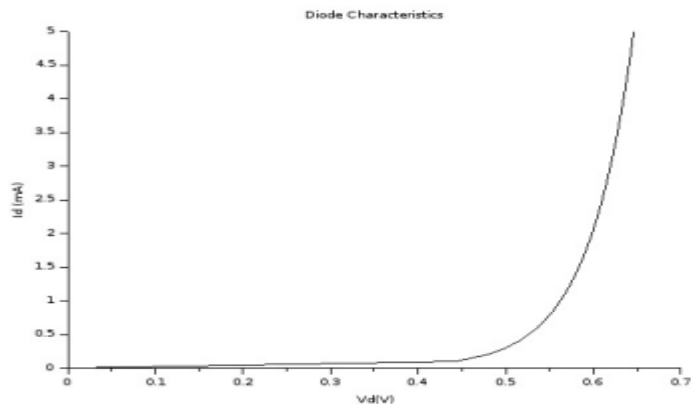
- Open MULTISIM Software.
- Click=> New => Design1
- Click **save as** in Desk Top rename the Design1 to your circuit name.
- Go to Component tool bar and select the components.
- Draw the circuit of clipper and clamper as shown above.
- Set the input Sine wave frequency of 10 KHz to input and voltage =10V.
- Click **simulate** button or press F5 key => RUN
- Measure the input and output wave with CRO.
- Note down the input and output voltage and waveforms.

Result:

The clipper and clamper circuits are designed and verified

```
clear ;clc; // Scilab 5.5.1, Ubuntu 16.04 LTS
// Plot the diode/transistor characteristics
Io = 2e -8; // Reverse saturation current
Id = [0:0.1:5] ' * 10^(-3);
Vd = 0.052* log ( Id / Io + 1); // Diode equation
plot2d ( Vd , Id *10^3)
xlabel ( 'Vd (V) ' );
ylabel ( ' Id (mA) ' )
title ( ' Diode Characteristics ' )
```

Plot the diode/transistor characteristics using SCI Lab



7. SUGGESTED BOOKS

1. Fundamentals of Electronic Devices and Circuits, David A. Bell 5th Ed.
2. Electronic Devices and Circuits – R.L Boylestad and Loius Nashelsky, 9ed, 2006, PEI/PHI
3. Millman's Electronic Devices and Circuits – J.Millman, C.C Halkias and Satyabrata 2ed. 1998, TMH
4. J. Millman and H. Taub, "Pulse & Digital and Switching Waveforms" 2nd ed., Tata McGraw-Hill, 2008.
5. A. Anand Kumar, "Pulse and Digital Circuits", 2nd ed., PHI, 2009.

8. WEB SITES

1. <http://www.engineersgarage.com/electronic-circuits>
2. <http://archive.org/details/ElectronicDevicesCircuits>
3. <http://www.gobooke.net/electronic-devices-and-circuits/>
4. <http://engineeringppt.blogspot.in/electronic-devices-and-circuits.html>
5. http://www.ieeeahn.org/wiki/index.php/IEEE_Electron_Devices_Society_History
6. <http://www.documbase.com/electronic-devices-and-circuits-fundamentals.pdf>
7. <http://search.edaboard.com/electronic-books.html>
8. <http://www.general-files.com/files-d/download-electronic-devices-and-circuits/8/>

9. EXPERTS' DETAILS

INTERNATIONAL

1. J. Millman ph.d and C.C.Halkias ph.d-

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REGIONAL

1. P. John Paul
Dean Academics in Gurunanak Engineering College,
Hyderabad
2. K. Lal Kishore
Professor of ECE and Director of Academic and Planning,
JNTU Hyderabad

10 .LAB SCHEDULE: (GROUP-I)

CYCLE 1

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| B1 | Demo | Exp.1 | Exp.2 | Exp.3 | Exp.9 | Exp.8 | test |
| B2 | Demo | Exp.2 | Exp.10 | Exp.9 | Exp.8 | Exp.1 | test |
| B3 | Demo | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.2 | test |
| B4 | Demo | Exp.9 | Exp.8 | Exp.1 | Exp.2 | Exp.1 0 | test |
| B5 | Demo | Exp.8 | Exp.1 | Exp.2 | Exp.1 0 | Exp.9 | test |

CYCLE 2

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---------|--------|--------|--------|--------|--------|--------|--------|
| B1 | Exp.3 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | test |
| B2 | Exp.7 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | test |
| B3 | Exp.3 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | test |
| B4 | Exp.10 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | test |
| B5 | Exp.9 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | test |

LAB SCHEDULE: (GROUP-II)**CYCLE 1**

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---------|--------|--------|--------|--------|------------|------------|--------|
| B1 | Demo | Exp.1 | Exp.2 | Exp.3 | Exp.9 | Exp.8 | test |
| B2 | Demo | Exp.2 | Exp.10 | Exp.9 | Exp.8 | Exp.1 | test |
| B3 | Demo | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.2 | test |
| B4 | Demo | Exp.9 | Exp.8 | Exp.1 | Exp.2 | Exp.1 0 | test |
| B5 | Demo | Exp.8 | Exp.1 | Exp.2 | Exp.1 0 | Exp.9 | test |

CYCLE 2

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|---------|--------|--------|--------|--------|--------|--------|--------|
| B1 | Exp.3 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | test |
| B2 | Exp.7 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | test |
| B3 | Exp.3 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | test |
| B4 | Exp.10 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | test |
| B5 | Exp.9 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | test |

(B) VIVA SCHEDULE: The viva schedule should be planned prior starting to the lab experiment.

ROUND – 1

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 |
|----------|--------|--------|--------|--------|--------|
| B1,B2,B3 | viva | | | | |
| B1,B2,B3 | | viva | | | |
| B1,B2,B3 | | | viva | | |
| B1,B2,B3 | | | | viva | |
| B1,B2,B3 | | | | | viva |

ROUND – 2

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 |
|---------|--------|--------|--------|--------|--------|
| SG1 | viva | | | | |
| SG2 | | viva | | | |
| SG3 | | | viva | | |
| SG4 | | | | viva | |
| SG5 | | | | | viva |

*SG: Selected Group with a maximum of 6 or 12 stud

(C)SCHEME OF EVALUATION

EXTERNAL EXAM

| S no. | Write-up (by Internal examiner) | Results (by skill assistant) | Final evaluation (Internal Examiner) | Viva (External Examiner) |
|---|---|--|--|--|
| 1 | Circuit, Equipment needed, Design, Procedure, Precautions, Tabular form, Expected graph | Based on observation, How the student is connecting the circuit, usage of equipment and typical readings | Based on correctness of the practical graph to the expected graph and results. | Based on understanding of Experiment and theoretical questions in the related subject. |
| | Marks: 20 | Marks: 10 | Marks: 10 | Marks: 10 |
| Total Marks:20+10+10+10=50 Marks | | | | |

INTERNAL LABS

| Day to Day Evaluation ----- 15 Marks | | | | | Internal Exam ---10M Marks | | |
|--------------------------------------|----------------------|---------------------------|---------|-----------|----------------------------|----------------------|-----------|
| Uniform | Observation & Record | Performance of experiment | Result | Viva Voce | Write-up | Connections & Result | Viva Voce |
| Marks:3 | Marks:3 | Marks:3 | Marks:3 | Marks:3 | Marks:3 | Marks:3 | Marks:3 |
| Total Marks:15+10=25 Marks | | | | | | | |

11.PROJECT/PRODUCT/PAPER BASED LEARNING

Crystal Tester

Crystal is used as an oscillator, to generate a high frequency. In all the major electronic projects crystal is used instead of coil. It is easy to test a coil using a [multimeter](#) but it is quite tough to test a crystal. So in order to overcome this problem this simple project is designed using few passive components for testing the crystal.

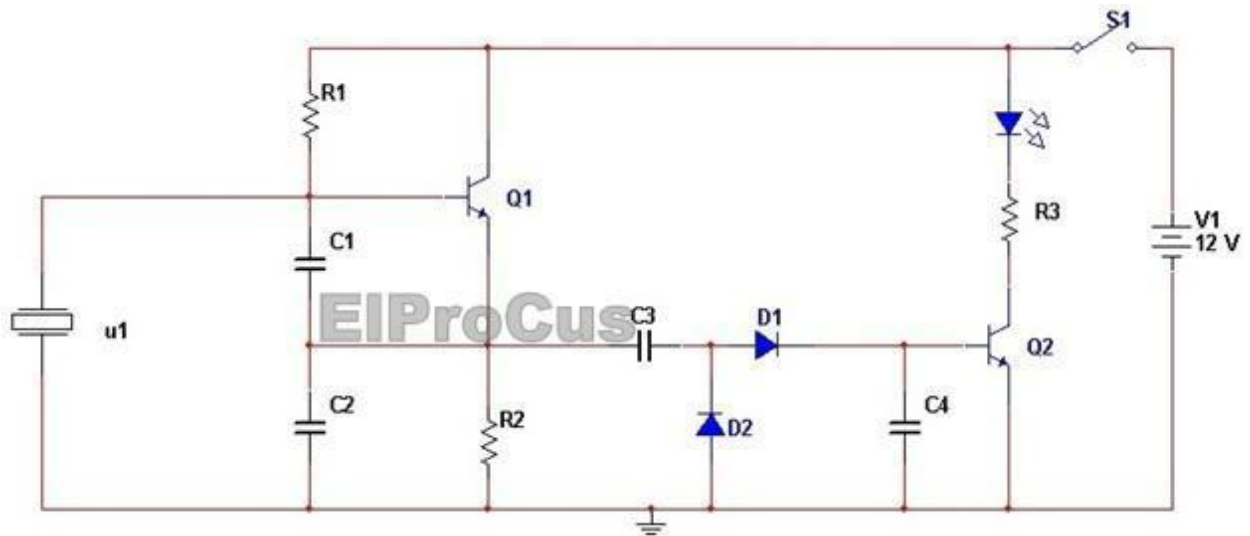
Circuit components:

| Component | Value |
|--------------------------------|-----------------------|
| R1 | 27KOhms |
| R2 | 1KOhms |
| R3 | 560Ohms |
| C1 | 0.001uF |
| C2 | 100uF |
| C3 | 0.001uF |
| S1 | SPST switch |
| C4 | 0.004uF |
| Diodes(D1, D2) | IN4007 |
| LED | Green LED |
| U1 | Crystal Oscillator |
| Transistors(NPN)(Q1 and Q2) | BC550 |
| Battery | 12V |

Circuit Connection

This electronic circuit consists of a crystal oscillator, two capacitors and a transistor forming a Colpitt oscillator. A combination of diodes and capacitors are used for rectification and filtering respectively. Another NPN transistor is used as a switch to make the LED glow.

Circuit Diagram



Circuit Operation

The entire circuit is operated with two transistors, two diodes, and few passive components. If the testing crystal is good then it operates as an oscillator in combination with transistor. The diode rectifies the output of the oscillator and the capacitor filters the output. This output is now fed to the base of the transistor and the transistor starts conducting.

An LED is connected to the collector of the transistor through the resistor. The LED gets proper biasing and starts emitting light, i.e. it starts glowing. In case if any fault occurring in the testing crystal then the LED does not glow.

12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D

PROPOSALS

The lab course should be designed in such a way that it should meet the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: Project Design & Execution

Proposal 2: R& D Level Project Design & Execution

Proposal 3: Consultancy Task / Project Design & Development

PROPOSAL FOR R & D ACTIVITY:

LED-BASED MESSAGE DISPLAY

Description:

This LED-based message display is built around readily available, low cost components. It is easy to fabricate and makes use of 3mm red LEDs. A total of 172 LEDs have been arranged to display the message “HAPPY NEW YEAR 2014.” The arrangement of LED1 through LED11 is used to display ‘H’ as shown in Fig. 1. The anodes of LED1 through LED11 are connected to point A and the cathodes of these LEDs are connected to point B. Similarly, letter ‘A’ is built using LED12 through LED21. All the anodes of LED12 through LED21 are connected to point A, while the cathodes of these LEDs are connected to resistor R8 (not shown in the circuit diagram). Other letters/words can also be easily arranged to make the required sentence. The power supply for the message display circuit (Fig. 2) comprises a 0-9V, 2A step-down transformer (X1), bridge rectifier comprising diodes D1 through D4, and a filter capacitor (C1). IC 7806 (IC1)

Fig. 1: LED arrangement for word ‘H’

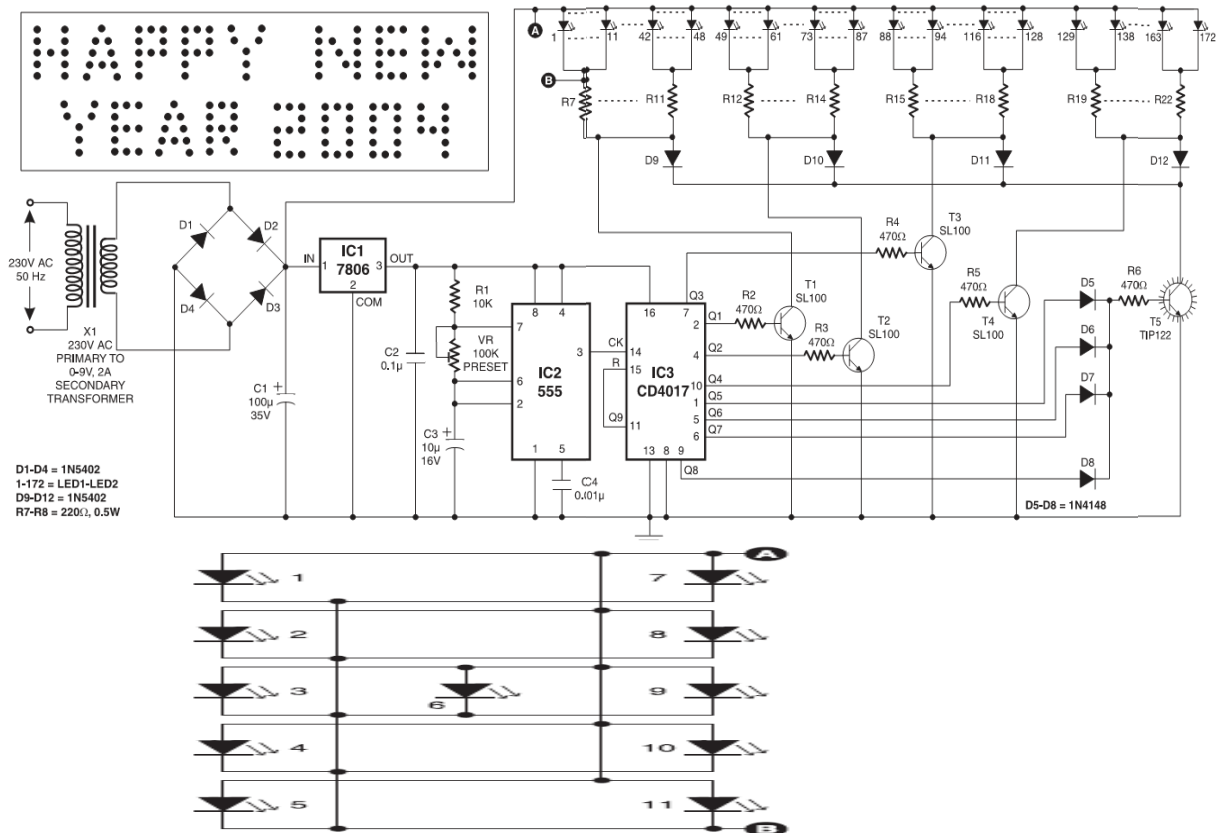


Fig. 2: Circuit diagram of LED-based message display

provides regulated 6V DC to the display circuit comprising timer 555 (IC2) and decade counter CD4017 (IC3). The astable multivibrator built around IC2 produces 1Hz clock at its output pin 3. This output is connected to clock pin (pin 14) of the decade counter. The decade counter can count up to 10. The output of IC3 advances by one count every second (depending on the time period of astable multivibrator IC2). When Q1 output of IC3 goes high, transistor T1 conducts and the current flows through LED1 through LED48 via resistors R7 through R11. Now the word 'HAPPY' built around LED1 through LED48 is displayed on the LED arrangement board. Next, when Q2 output of IC3 goes high, transistor T2 conducts and the current flows through LED49 through LED87 via resistors R12 through R14. Now the word 'NEW' is displayed on the LED arrangement board. Again, when Q3 output goes high, transistor T3 conducts and the current flows through LED88 through LED128 via resistors R15 through R18. Now the word 'YEAR' is displayed on the LED arrangement board. Similarly, when Q4 output goes high, transistor T4 conducts and the current flows through LED129 through LED172 via resistors R19 through R22. Now digits '2004' are displayed on the LED arrangement board. During the entire period when Q5, Q6, Q7, or Q8 output go high, transistor T5 conducts and the current flows through all the LEDs via diodes D9 through D12 and resistors R7 through R22. Now the complete message "HAPPY NEW YEAR 2004" is displayed on the LED arrangement for four seconds. Thus, the display board displays 'HAPPY,' 'NEW,' 'YEAR' and '2004' one after another for one second each. After that, the message "HAPPY NEW YEAR 2004" is displayed for 4 seconds (because Q5 through Q8 are connected to resistor R6 via diodes D5 through D8). At the next clock input output Q9 goes high, and IC3 is reset and the display is turned off for one second. Thereafter the cycle repeats.

How to Build an LED Flasher Using an Oscillator

An electronic circuit that generates repeated waveforms is an oscillator. The exact waveform generated depends on the type of circuit used to create the oscillator. Some circuits generate sine waves, some generate square waves, and others generate other types of waves. Oscillators are essential ingredients in many different types of electronic devices, including radios and computers.

One of the most commonly used oscillator circuits is made from a pair of transistors that are rigged up to alternately turn on and off. This type of circuit is called a *multivibrator*.

If the circuit is designed to continuously cycle between the two transistors, it's called an *astable multivibrator* because the circuit never reaches a point of stability — that is, it never decides which of the two transistors should be on, so it just keeps flipping back and forth between the two. Astable multivibrators are great for producing square waves.

In Project 6-3, you build a circuit that uses an astable multivibrator to alternately flash two LEDs. LED flasher circuits are a favorite of electronic hobbyists because flashing LEDs have all sorts of fun uses. For example, you can add creepy blinking eyes to a jack-o'-lantern for Halloween, or you can add blinking warning lights to your model railroad layout.

The LED flasher circuit is simply an astable multivibrator with LEDs added to the collector circuit of each transistor and filled in the resistor and capacitor values. With the values selected for this project, the lights alternate quickly, a bit faster than once per second.

If you feel like experimenting a bit after you complete this project, here are a couple of suggestions:

- Try replacing R2 and R3 with larger resistors, such as 220 kΩ and 470 kΩ. What effect does this have on the flasher?
- Try adding a potentiometer in series with R2 or R3. This allows you to vary the flash rate by turning the potentiometer knob.
- Try changing the capacitors.

FUNDED/ UNFUNDED PROPOSALS:

The proposal for Two Weeks Embedded Systems Faculty Development Programme (FDP) under AICTE grants is applied and waiting for its approval.

13. GUIDELINES FOR SHADOW ENGINEERING (VIP) AND INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM)

GUIDELINES FOR SHADOW ENGINEERING (VIP)

INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM):

OBJECTIVES OF SHADOW ENGINEERING:

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future assignments.
4. This program leads to matrixing with the students.

TABLE 1: INDUSTRIAL VISITS

As of now no industrial visits is proposed.

| S. No | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | Remarks |
|-------|---------------------|--------------------|---------------|------------------------------|-------------|---------|
| 1 | Pacific Electronics | Circuit Design | | 60 | II/ECE | 1 |

| | | | | | | |
|---|-----------------------|-----------------------|--|----|--------|---|
| | PVT LTD | | | | | |
| 2 | Sun Light Electronics | Application Designers | | 60 | II/ECE | 2 |

**TABLE 2: INDUSTRIAL TRAINING (Shadow Engineering)
(Career Visit Approval)**

Three day training on Custom IC design using 45 nm technologies is proposed at CDAC, Hyderabad.

| S.No | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/Certificate No. | Remarks |
|------|--------------------|---|----------------------|-----------|----------------------------------|---------|
| 1 | OFC | Advanced Training Institute for Electronics and Process Instrumentation | 1 Week | GM | | |

14. ACTIVITIES IN LIFT PROGRAM

CALIBRATION/INSTALLATION AND TESTING:

Calibration: Aim of this concept is to check:

- i. whether all the equipment is functioning correctly as per the standards
- ii. To bring correctness in the errors of instrument or equipment.
- iii. To rectify the errors if any

Installation: Aim of this concept is to make and maintain installation procedure for a New equipment or already existing equipment

Testing : Aim of this concept is to test the equipment after installation whether it Meets the existing standards.

The list of equipments (hardware/software) :

- Necessity of tools for development and testing
- Equipment to be calibrated
- Installation of supporting equipment if any.

PROCEDURE FOR CALIBRATION:

Any Equipment or Instrument or Gauge or Machine can be calibrated as the standard guidelines mentioned under:

1. Identify the Equipment/Instrument/Gauge/Machine which is under defective or to be calibrated or correction for error
2. Identify the type of error and estimate its frequency of variation.
3. Check with Master Standards or equipment/instrument/machine which is working correctly and meeting our requirements.
4. Estimate the frequency of deviations from normal mode.
5. If the equipment is under warranty, then inform to concerned supplier or agency who will carry out calibration.
6. If the equipment is out of warranty then we can compare the deviations and set the error rectification.
7. Generally as per the procedure, the equipment or instruments can be calibrated by the agencies and issue calibration certificate which consists of date of calibration, calibration next due date and remarks as mentioned in the following format.
8. Record and keep all the calibration certificates in safe custody.

After calibration the details of equipment should be submitted in following format.

| S.no | Type of equipment | Certificate no | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|------|--------------------------|----------------|----------------------------|---------------------|-------------------------|---------|
| 1 | Cathode ray Oscilloscope | | SS Instruments, Kukatpally | | | |
| 2 | Trainer Kits | | SS Instruments, Kukatpally | | | |
| 3 | Cathode ray Oscilloscope | | -do- | | | |

iv. Calibration, Testing and Installation details equipment wise are mentioned as follows:

Case 1: Calibration of Equipment ----- if any

Case 2: Installation of Equipment ----- if any

Case 3: Testing of Equipment ----- if any

Presently there is no new equipment is present for either testing or installations.

15. MAINTAINANCE AND TROUBLESHOOTING :

Maintenance:

Maintenance and trouble shooting of each equipment in a laboratory must follow the following guidelines:

Maintenance Schedules:

(1) Preventive Maintenance Schedules of lab will be decided by lab in charge along with concerned HOD. The details of schedule should be recorded in the following template of format.

| S.No. | Name of the Equipment | Date of Maintenance | Type of Activity | Remarks |
|-------|--------------------------|---------------------|----------------------------------|--------------|
| 1 | Cathode ray Oscilloscope | | Cleaning and Servicing | Working well |
| 2 | Trainer Kits | | Testing and Troubleshooting | Working OK |
| 3 | Power Supply's | | Testing and Troubleshooting | Working OK |
| 4 | Multi-meters | | Error Correction and Calibration | Working OK |

(2) Maintenance Reports duly signed by in charges as well as HODs and duly approved by Principal periodically.

TROUBLE SHOOTING SCHEDULES:

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.

S.No., Equipment Name , Type of Problem (Too much Noise, Abnormal Sound, Corrupt Software, Anti Virus Problem, Missing of Display, CRT not working, Motor is not giving signal, Digital display is not working, Break of tools, Mis alignment of machine elements, PLC is not properly working), Expected Reasons (Bearing failure, Improper alignment of machine centres, Missing of vibration pads etc)

Trouble shooting exercises should be properly recorded in a separate format as mentioned below:

| S.No. | Date of recording activity | Equipment Name | Type of Trouble | Remedial Activity | Remarks |
|-------|----------------------------|----------------|-----------------|-------------------|---------|
| | | | | | |

16. ASSESSMENT AND ACCREDITATION PROCEDURE AS PER

NABL

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories)

The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

1. Preparation of methodology in each experiment
2. Preparation of Standard Operating procedure for each equipment
3. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team (CLT) headed by Principal/HOD/Dean/incharge
4. Ensure Effective environmental conditions (temperature, humidity, storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.
5. Ensure Calibration of instruments/equipment (Only NABL accredited authorized laboratories provide calibration).
6. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
7. Ensure proper implementation of all the documents, formats to be included in the lab manual.
8. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.

-
9. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
 10. Auditors should submit the detailed report of each lab duly signed to the Principal.
 11. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
 12. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.
 13. All the safety precautions are properly displayed in front of each lab.
 14. All the Lead experiments should be maintained separately in a record /record in a separate folder.
 15. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal.

SUBJECTWISE LAB PLANNER

NAME OF THE SUBJECT: DIGITAL SIGNAL PROCESSING LABORATORY

17. OBJECTIVES AND RELEVANCE

18. SCOPE

19. PREREQUISITES

20. SYLLABUS AS PER JNTUH

21. LEAD EXPERIMENT

22. VIRTUAL LAB EXPERIMENT

23. SUGGESTED BOOKS

24. WEBSITES (USEFUL LINKS)

25. EXPERT DETAILS

26. (A)LAB SCHEDULE

(B)VIVA SCHEDULE

(C)SCHEME OF EVALUATION

27. PROJECT/PRODUCT/PAPER BASED LEARNING

**28. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D
PROPOSALS**

**29. GUIDELINES FOR SHADOW ENGINEERING AND
INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL
LEARNING PROGRAM)**

30. ACTIVITIES IN LIFT PROGRAM

31. MAINTAINANCE AND TROUBLESHOOTING

**32. ASSESSMENT AND ACCREDITATION PROCEDURE AS PER
NABL**

1. OBJECTIVE AND RELEVANCE:

- To emphasize the teaching of key DSP concepts , such as overview of discrete time signal and systems in time domain, and frequency domain, sampling and reconstruction of analog signals, signal and systems representation in complex frequency domain, solution of differential equations using z transform, computation of Fourier transform and its efficient implementation, Discrete Fourier transform and Fast Fourier transform, Structure for the implementation of digital filters, FIR Filter design and IIR Filter Design
- To provide an understanding of how to design signal processing systems and Process data in a software simulation like using MATLAB.
- Digital Signal Processing (DSP) can be described as the processing of signals using digital techniques or digital computers. A signal is a piece of information in binary or digital form. Digital Signal processing techniques improve signal quality or extract important information by removing unwanted part of the signal.

2. SCOPE:

1. The lab helps the students in designing and simulation of various DSP based circuits. The lab is equipped with MATLAB software.
2. The goal of DSP is usually to measure, filter and/or compress continuous real-world analog signals. But to deal with real life analog signals from our environment, it is necessary to convert them to digital form, and vice-versa. This lab boasts of plenty of powerful computers preinstalled with MATLAB and Code Composer Studio (CCStudio), and high-speed Digital Signal Processors of the TMS320C6713 Digital Starter Kit (DSK) family by Texas Instruments. Using these, students are able to perform real-time analysis of signals and get hands-on experience about the theory they have learned in the class. This is used as regular lab for undergraduate students. Some research scholar uses this lab for development of algorithms which can be ported to hardware for real time applications.

3. PREREQUISITES:

The prerequisites for this lab are signals and systems, General mathematical formulas and basic knowledge in digital signal including the fundamentals.

4. JNTUH SYLLABUS: The lab course should be planned as per the JNTUH syllabus.

In this, LEAD experiments should also be included in cycle of experiments

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT / IDFT of given DT Signal
4. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s).
8. Implementation of LP FIR Filter for a given Sequence/Signal.
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems.

EXPERIMENT NO. 1

Generation of Sinusoidal waveform/Signal based on recursive difference equations

OBJECTIVE

We generate the sinusoidal wave form and we will save the output samples in a buffer array and inspect the generated waveform both in the time and frequency domains using CCS's graphing capabilities.

PREREQUISITES

Knowledge of basic sinusoidal signal generation

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Connection of experiment and its verifications
- c. Experimental determination of sinusoidal wave form
- d. Graphical determination of sinusoidal wave in time and frequency

APPLICATIONS

1. AC supply.
2. Linear network.

EXPERIMENT NO. 2

Histogram of White Gaussian Noise and Uniformly Distributed Noise.

OBJECTIVE

To find Histogram of White Gaussian Noise and Uniformly Distributed Noise using MATLAB

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation

-
- c. Use the appropriate library function
 - d. Display the waveform

APPLICATIONS

1. Communication

EXPERIMENT NO. 3

To find DFT/IDFT of given DT signal

OBJECTIVE

1. To study and investigate the Discrete Fourier Transform
2. To learn how to implement the operation using MATLAB
3. To learn how to analyze discrete-time signal using DFT

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

1. In Sinusoidal wave forms
2. In signals

EXPERIMENT NO. 4

To find frequency response of a given system given in (Transfer function/Differential equation form)

OBJECTIVE

We will generate the signal and we will find the frequency response of the given system in Transfer function /Differential equation form and graphical representation of the output signal.

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation

-
- c. Use the appropriate library function
 - d. Display the waveform

APPLICATIONS

1. Used to compute the coefficients of a discrete Fourier series.

EXPERIMENT NO.5

Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.

OBJECTIVE

To Obtain Fourier series coefficients by formula and using FET and compare for half sine wave using MATLAB.

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

- 1.Used in radio communications, Radars

EXPERIMENT NO.6

Implementation of FFT of given sequence

OBJECTIVE

To find the FFT of a given sequence using MATLAB.

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

Communication, Signal processing

EXPERIMENT NO.7

Determination of Power spectrum of a given signal(s)

OBJECTIVE

To find the power spectrum of a given signal

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

- 1.Used in radio communications, Radars

EXPERIMENT NO.8

Implementation of LP FIR filter for a given sequence.

OBJECTIVE

To find the frequency response of LP FIR filter.

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

1. Low pass filters are extensively used in the design of decimators and interpolators.

EXPERIMENT NO.9

Implementation of HP IIR filter for a given sequence.

OBJECTIVE

To find the frequency response of HP IIR filter.

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

- 1.Used to remove noise in audio signals.

EXPERIMENT NO.10

Generation of Narrow Band Signal through Filtering

OBJECTIVE

To implement the Decimation process using MATLAB

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

- 1.Used in filters to improve efficiency

EXPERIMENT NO.11

1. Generation of DTMF Signals

OBJECTIVE

To generate DTMF using MATLAB

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

- 1.Used in communication

EXPERIMENT NO.12

Implementation of Decimation Process

OBJECTIVE

To implement the Decimation process using MATLAB

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

- 1.Used in filters to improve efficiency

EXPERIMENT NO.13

Implementation of Interpolation Process

OBJECTIVE

To implement the Interpolation process using MATLAB

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

1. Used in filters to improve efficiency

EXPERIMENT NO.14

Implementation of I/D sampling rate converters.

OBJECTIVE

To implement I/D sampling rate converters using MATLAB

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

1. Used in Image processing

EXPERIMENT NO.15

Impulse Response of First order and Second Order Systems

OBJECTIVE

To Impulse Response of First order and Second Order Systems using MATLAB

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for signal generation
- c. Use the appropriate library function
- d. Display the waveform

APPLICATIONS

1. Used in Signal Processing

5. LEAD EXPERIMENT

Implementation DFT and IDFT on a Image: (With using built in functions)

OBJECTIVE

To find DFT and IDFT on a Image using MATLAB

DESCRIPTION

- a. Introduction to experiment -30 min
- b. Get the inputs for image generation
- c. Use the appropriate library function
- d. Display images

APPLICATIONS

- a. Used in image processing.

5. LEAD Experiment:

DFT and IDFT on a Image

Theory:

Brief Description

The Fourier Transform is an important image processing tool which is used to decompose an image into its sine and cosine components. The output of the transformation represents the image in the *Fourier* or [frequency domain](#), while the input image is the [spatial domain](#) equivalent. In the Fourier domain image, each point represents a particular frequency contained in the spatial domain image.

The Fourier Transform is used in a wide range of applications, such as image analysis, image filtering, image reconstruction and image compression.

How It Works

As we are only concerned with digital images, we will restrict this discussion to the *Discrete Fourier Transform* (DFT).

The DFT is the sampled Fourier Transform and therefore does not contain all frequencies forming an image, but only a set of samples which is large enough to fully describe the spatial domain image. The number of frequencies corresponds to the number of pixels in the spatial domain image, *i.e.* the image in the spatial and Fourier domain are of the same size.

For a square image of size $N \times N$, the two-dimensional DFT is given by:

$$F(k, l) = \sum_{i=0}^{N-1} \sum_{j=0}^{N-1} f(i, j) e^{-i2\pi(\frac{ki}{N} + \frac{lj}{N})}$$

where $f(a, b)$ is the image in the spatial domain and the exponential term is the basis function corresponding to each point $F(k, l)$ in the Fourier space. The equation can be interpreted as: the value of each point $F(k, l)$ is obtained by multiplying the spatial image with the corresponding base function and summing the result.

The basis functions are sine and cosine waves with increasing frequencies, *i.e.* $F(0, 0)$ represents the DC-component of the image which corresponds to the average brightness and $F(N-1, N-1)$ represents the highest frequency.

In a similar way, the Fourier image can be re-transformed to the spatial domain. The inverse Fourier transform is given by:

$$f(a, b) = \frac{1}{N^2} \sum_{k=0}^{N-1} \sum_{l=0}^{N-1} F(k, l) e^{i2\pi(\frac{ka}{N} + \frac{lb}{N})}$$

Note the $\frac{1}{N^2}$ normalization term in the inverse transformation. This normalization is sometimes applied to the forward transform instead of the inverse transform, but it should not be used for both. \$\$

To obtain the result for the above equations, a double sum has to be calculated for each image point. However, because the Fourier Transform is *iseparable*, it can be written as

$$F(k, l) = \frac{1}{N} \sum_{b=0}^{N-1} P(k, b) e^{-i2\pi \frac{lb}{N}}$$

where

$$P(k, b) = \frac{1}{N} \sum_{a=0}^{N-1} f(a, b) e^{-i2\pi \frac{ka}{N}}$$

Using these two formulas, the spatial domain image is first transformed into an intermediate image using N one-dimensional Fourier Transforms. This intermediate image is then transformed into the final image, again using N one-dimensional Fourier Transforms. Expressing the two-dimensional Fourier Transform in terms of a series of $2N$ one-dimensional transforms decreases the number of required computations.

Even with these computational savings, the ordinary one-dimensional DFT has N^2 complexity. This can be reduced to $N \log_2 N$ if we employ the *Fast Fourier Transform* (FFT) to compute the one-dimensional DFTs. This is a significant improvement, in particular for large images. There are various forms of the FFT and most of them restrict the size of the input image that may be transformed, often to $N = 2^n$ where n is an integer. The mathematical details are well described in the literature.

The Fourier Transform produces a complex number valued output image which can be displayed with two images, either with the *real* and *imaginary* part or with *magnitude* and *phase*. In image processing, often only the magnitude of the Fourier Transform is displayed, as it contains most of the information of the geometric structure of the spatial domain image. However, if we want to re-transform the Fourier image into the correct spatial domain after some processing in the frequency domain, we must make sure to preserve both magnitude and phase of the Fourier image.

The Fourier domain image has a much greater range than the image in the spatial domain. Hence, to be sufficiently accurate, its values are usually calculated and stored in float values.

Guidelines for Use

The Fourier Transform is used if we want to access the geometric characteristics of a spatial domain image. Because the image in the Fourier domain is decomposed into its sinusoidal components, it is easy to examine or process certain frequencies of the image, thus influencing the geometric structure in the spatial domain.

In most implementations the Fourier image is shifted in such a way that the DC-value (*i.e.* the image mean) $F(0,0)$ is displayed in the center of the image. The further away from the center an image point is, the higher is its corresponding frequency.

We start off by applying the Fourier Transform of



The magnitude calculated from the complex result is shown in

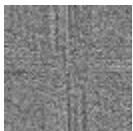


We can see that the DC-value is by far the largest component of the image. However, the dynamic range of the Fourier coefficients (*i.e.* the intensity values in the Fourier image) is too large to be displayed on the screen, therefore all other values appear as black. If we apply a [logarithmic transformation](#) to the image we obtain



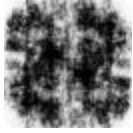
The result shows that the image contains components of all frequencies, but that their magnitude gets smaller for higher frequencies. Hence, low frequencies contain more image information than the higher ones. The transform image also tells us that there are two dominating directions in the Fourier image, one passing vertically and one horizontally through the center. These originate from the regular patterns in the background of the original image.

The phase of the Fourier transform of the same image is shown in



The value of each point determines the phase of the corresponding frequency. As in the magnitude image, we can identify the vertical and horizontal lines corresponding to the patterns in the original image. The phase image does not yield much new information about the structure of the spatial domain image; therefore, in the following examples, we will restrict ourselves to displaying only the magnitude of the Fourier Transform.

Before we leave the phase image entirely, however, note that if we apply the inverse Fourier Transform to the above magnitude image while ignoring the phase (and then [histogram equalize](#) the output) we obtain



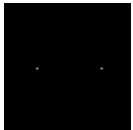
Although this image contains the same frequencies (and amount of frequencies) as the original input image, it is corrupted beyond recognition. This shows that the phase information is crucial to reconstruct the correct image in the spatial domain.

We will now experiment with some simple images to better understand the nature of the transform. The response of the Fourier Transform to periodic patterns in the spatial domain images can be seen very easily in the following artificial images.

The image



shows 2 pixel wide vertical stripes. The magnitude of the Fourier transform of this image is shown in



If we look carefully, we can see that it contains 3 main values: the DC-value and, since the Fourier image is symmetrical to its center, two points corresponding to the frequency of the stripes in the original image. Note that the two points lie on a horizontal line through the image center, because the image intensity in the spatial domain changes the most if we go along it horizontally.

The distance of the points to the center can be explained as follows: the maximum frequency which can be represented in the spatial domain are two pixel wide stripe pairs (one white, one black).

$$f_{\max} = \frac{1}{2 \text{ pixels}}$$

Hence, the two pixel wide stripes in the above image represent

$$f = \frac{1}{4 \text{ pixels}} = \frac{f_{\max}}{2}$$

Thus, the points in the Fourier image are halfway between the center and the edge of the image, *i.e.* the represented frequency is half of the maximum.

Further investigation of the Fourier image shows that the magnitude of other frequencies in the image is less than $\frac{1}{100}$ of the DC-value, *i.e.* they don't make any significant contribution to the image. The magnitudes of the two minor points are each two-thirds of the DC-value.

Similar effects as in the above example can be seen when applying the Fourier Transform to



which consists of diagonal stripes. In



showing the magnitude of the Fourier Transform, we can see that, again, the main components of the transformed image are the DC-value and the two points corresponding to the frequency of the stripes. However, the logarithmic transform of the Fourier Transform,



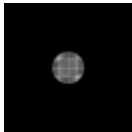
shows that now the image contains many minor frequencies. The main reason is that a diagonal can only be approximated by the square pixels of the image, hence, additional frequencies are needed to compose the image. The logarithmic scaling makes it difficult to tell the influence of single frequencies in the original image. To find the most important frequencies we [threshold](#) the original Fourier magnitude image at level 13. The resulting Fourier image,



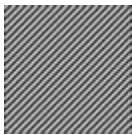
shows all frequencies whose magnitude is at least 5% of the main peak. Compared to the original Fourier image, several more points appear. They are all on the same diagonal as the three main components, *i.e.* they all originate from the periodic stripes. The represented frequencies are all multiples of the basic frequency of the stripes in the spatial domain

image. This is because a rectangular signal, like the stripes, with the frequency f_{rect} is a composition of sine waves with the frequencies $f_{sine} = n \times f_{rect}$, known as the harmonics of f_{rect} . All other frequencies disappeared from the Fourier image, *i.e.* the magnitude of each of them is less than 5% of the DC-value.

A Fourier-Transformed image can be used for [frequency filtering](#). A simple example is illustrated with the above image. If we multiply the (complex) Fourier image obtained above with an image containing a circle (of $r = 32$ pixels), we can set all frequencies larger than f_{rect} to zero as shown in the logarithmic transformed image



By applying the inverse Fourier Transform we obtain

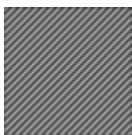


The resulting image is a lowpass filtered version of the original spatial domain image. Since all other frequencies have been suppressed, this result is the sum of the constant DC-value and a sine-wave with the frequency f_{rect} . Further examples can be seen in the worksheet on [frequency filtering](#).

A property of the Fourier Transform which is used, for example, for the removal of additive [noise](#), is its *distributivity over addition*. We can illustrate this by [adding](#) the complex Fourier images of the two previous example images. To display the result and emphasize the main peaks, we threshold the magnitude of the complex image, as can be seen in



Applying the inverse Fourier Transform to the complex image yields



According to the distributivity law, this image is the same as the direct sum of the two original spatial domain images.

Matlab code:

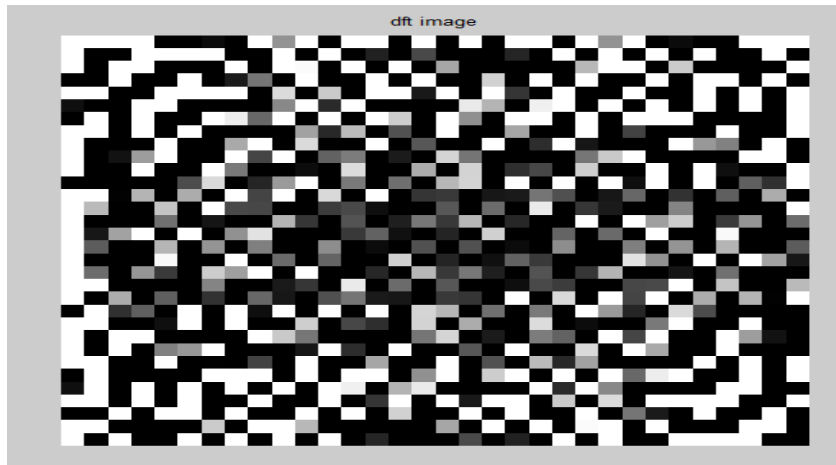
```
clc;
close all;
clear all;
f=imread('cameraman.tif');
[M N]=size(f);
imshow(f);
title('cameraman');
k=fft2(f);
k=fft2(f,M,N);
figure,imshow(k);
title('dft image');
imwrite(k,'dftimage.tif');
q=imread('dftimage.tif');
p=ifft2(q);
p=ifft2(q,M,N);
figure,imshow(q);
title('idft image');
```

SIMULATION RESULTS

Input image:



DFT image:



IDFT image:



6. VIRTUAL LAB EXPERIMENT:

A FIR filter is a digital filter whose impulse response settles to zero in finite time as opposed to an infinite impulse response filter (IIR), which uses feedback and may respond indefinitely to an input signal. The great thing about FIR filters is that they are inherently stable and can easily be designed to have linear phase. I won't get into the details much further on FIR filters and their pro's and con's as this tutorial focuses more on designing filters fast and efficiently with the aid of [Octave](#).

Typically, in FIR filter design the length of the filter will need to be specified. You can guess and check until the filter matches your expected bandwidth and cutoff requirements, but this could be a long and tedious process. The equation below is an efficient way to compute a reasonable starting length. After trying the calculated N, one can then tweak N or parameters which make up N to meet filter specifications.

Designing an FIR filter length to be odd length will give the filter an integral delay of $(N-1)/2$.

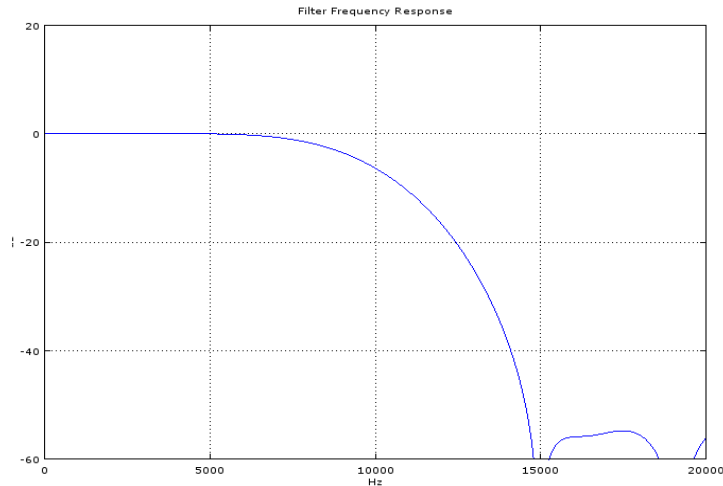
Using the Octave/Matlab code below, we can see how to design a lowpass filter with a bandwidth of 10kHz and a cutoff of 15kHz using Octave's built in fir1 function, which is well documented here

Octave Code:

```
close all;
clear all;
clf;
f1 = 10000;
f2 = 15000;
delta_f = f2-f1;
Fs = 192000;
dB = 40;
N = dB*Fs/(22*delta_f);

f = [f1 ]/(Fs/2)
hc = fir1(round(N)-1, f,'low')

figure
plot((-0.5:1/4096:0.5-1/4096)*Fs,20*log10(abs(fftshift(fft(hc,4096))))))
axis([0 20000 -60 20])
title('Filter Frequency Response')
grid on
```



7. SUGGESTED BOOKS:

1. Digital signal processing, principles, algorithms and applications: Johnn G.Proakis, Dimitris G.Monalakis, Pearson Education/PHI 2007
2. Discrete Time Signal Processing –A.V.Oppenheim and R.W.Schaffer,PHI 2009
3. Fundamentals of Digital Signal Processing-Loney Ludeman, John Wiley, 2009

8. WEB SITES (USEFUL LINKS):

1. VIDEO LECTURES:

<http://nptel.iitm.ac.in/video.php?subjectId=117102060>

2. Journals On DSP:

<http://www.journals.elsevier.com/digital-signal-processing/>

3. IIT KHARAGPUR DSP VIRTUAL LAB:

<http://www.digital.iitkgp.ernet.in/dsp/>

4. MIT OPEN COURSEWARE:

<http://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/>

-
5. Digital Signal Processing: Principles, Algorithms & Applications by J. G. Proakis,
Dimitris K Manolakis

<http://library.riphah.edu.pk/books%5Cengr%5CDSPPAApplications.pdf>

9. EXPERT DETAILS

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10. (A) **LAB SCHEDULE:** The lab schedule should be planned once in a week. The week wise Scheduled experiment should be completed.

CYCLE 1 (For 30 students per session and 3 students per batch)

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 | week-8 |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|
| B1, B2 | Demo | Exp.1 | Exp.2 | Exp.10 | Exp.9 | Exp.7 | Exp.8 | Lead1 |
| B3, B4 | Demo | Exp.2 | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Lead1 |
| B5, B6 | Demo | Exp.10 | Exp.9 | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Lead1 |
| B7, B8 | Demo | Exp.9 | Exp.8 | Exp.1 | Exp.3 | Exp.10 | Exp.2 | Lead1 |
| B9, B10 | Demo | Exp.8 | Exp.1 | Exp.2 | Exp.7 | Exp.3 | Exp.10 | Lead1 |

CYCLE 2(For 30 students per session and 3 students per batch)

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 | week-8 |
|---------|--------|--------|--------|--------|--------|--------|-------------|--------|
| B1, B2 | Exp.3 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Hobby/lead2 | test |
| B3, B4 | Exp.7 | Exp.6 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Hobby/lead2 | test |
| B5, B6 | Exp.3 | Exp.11 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Hobby/lead2 | test |
| B7, B8 | Exp.7 | Exp.12 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Hobby/lead2 | test |
| B9, B10 | Exp.9 | Exp.5 | Exp.4 | Exp.6 | Exp.11 | Exp.12 | Hobby/lead2 | test |

- (B) **VIVA SCHEDULE:** The viva schedule should be planned prior starting to the lab experiment.

ROUND - 1

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 | week-6 |
|-----------------|--------|--------|--------|--------|--------|--------|
| B1,B2,B3, B4 | viva | | | | | |
| B5,B6,B7,B8 | | viva | | | | |
| B9,B10,B11,B12 | | | viva | | | |
| B13,B14,B15,B16 | | | | viva | | |
| B17,B18,B19,B20 | | | | | viva | |
| | | | | | | Viva |

ROUND - 2

| Batches | week-1 | week-2 | week-3 | week-4 | week-5 |
|---------|--------|--------|--------|--------|--------|
| SG1 | viva | | | | |
| SG2 | | viva | | | |
| SG3 | | | viva | | |
| SG4 | | | | viva | |
| SG5 | | | | | viva |

*SG: Selected Group with a maximum of 6 or 12 students

(C) SCHEME OF EVALUATION

LAB EXTERNAL

| S no. | Write-up (by Internal examiner) | Final evaluation (Internal Examiner) | Viva (External Examiner) |
|--------------------------------------|---|--|---|
| 1 | Aim Equipment needed MATLAB code Theoretical- Calculations Expected graph | Based on observation, how the student is writing the code, usage of software And based on correctness of the practical graph to the expected graph and results. | Based on understanding of Experiment and theoretical questions in the related subject. |
| | Marks: 20 | Marks: 40 | Marks: 15 |
| Total Marks:20+40+15=75 Marks | | | |

LAB INTERNAL

| Day to Day Evaluation ----- 15 Marks | | | | | Internal Exam ---10M Marks | | |
|--------------------------------------|-----------------------------|--------------------------------------|---------------------|---------------------|-------------------------------|--------------------------------|---------------------|
| Unifor m | Observati on & Record | Performa nce of experime nt | Result | Viva Voce | Write-up | Conne ctions & Result | Viva Voce |
| Marks: 3 | Marks:3 | Marks:3 | Marks :3 | Marks: 3 | Marks:4 | Mark s:3 | Mark s:3 |
| Total Marks:15+10=25 Marks | | | | | | | |

11. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D:

The lab course is designed in such a way that it meets the requirements of research and development as well as consultancy projects. Also the Proposals of Project/R&D/Consultancy are as follows:

Proposal 1: Project Design & Execution

Proposal 2: R& D Level Project Design & Execution

Proposal 3: Consultancy Task / Project Design & Development

PROPOSAL FOR R & D ACTIVITY:

1. An exact paper from a National/International journal in this entitled area/subject/area (IEEE Format) AND/OR
2. An article/white paper from a magazine /journal/weekly/any periodical in the entitled subject AND/OR
3. An Advanced technology development/ proposal/article publication from any source of Information

PROPOSALS 2:

Abstract

We can capture an input signal, observe its waveform and variation with time on an oscilloscope, but further processing of the signal is not feasible with it. When we need to digitize signals into samples and observe the waveform through plotting, we need a computer along with software

PROPOSAL FOR PROJECT ACTIVITY:

1. A Proposal of a hobby/mini/proto/general/model/proto type project with extended abstract,
Block Diagram/Circuit/Flow diagram and clear references may be presented and executed.

Hobby Project:

Artifacts Removal in ECG Signal Using MATLAB

Theory:

The word *artifact* is similar to *artificial* in the sense that it is often used to indicate something that is not natural (i.e. man-made). In electrocardiography, an ECG artifact is used to indicate something that is not "heart-made." These include (but are not limited to) electrical interference by outside sources, electrical noise from elsewhere in the body, poor contact, and machine malfunction. Artifacts are extremely common, and knowledge of them is necessary to prevent misinterpretation of a heart's rhythm.

Pacing spikes

These are seen in someone whose implanted pacemaker is firing.

The sharp, thin spike seen in figure x-x is an electrical signal produced by an artificial pacemaker. The wide QRS complex that follows it represents the ventricles depolarizing. We say that the "(artificial) pacemaker *captures*" when it is able to successfully depolarize its intended target. If a pacing spike is not followed by its intended response, we say that it has *failed to capture*.

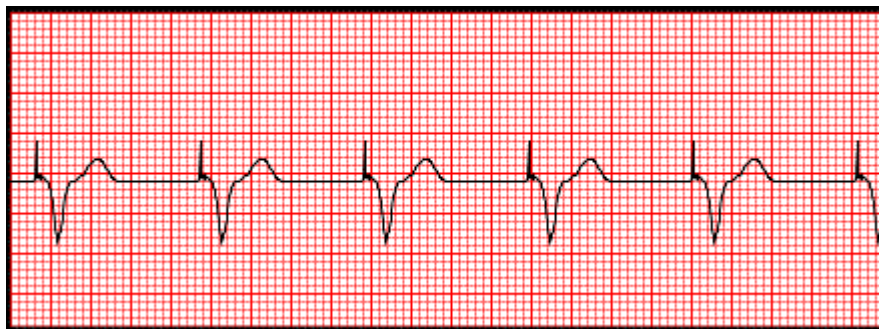


Figure 12-1 : Artificial pacemaker spikes

The wide QRS suggests that the pacemaker was implanted in the ventricles.

Reversed leads / misplaced electrodes

Electrode/lead placement is very important. If one were to accidentally confuse the red and white lead cables (i.e. place the white one where the red one should go, vice versa), he might get an ECG that looks like figure 12-2. In this ECG, we can make out a normal sinus rhythm with all of the waves upside-down. When this happens, you are essentially viewing the rhythm in a completely different lead.

One must also make sure that the lead wires are actually plugged into the machine. If your talkative patient shows asystole, you should suspect this. Many machines are "smart" in that they can sense common errors of this nature, but many such errors aren't always readily apparent.

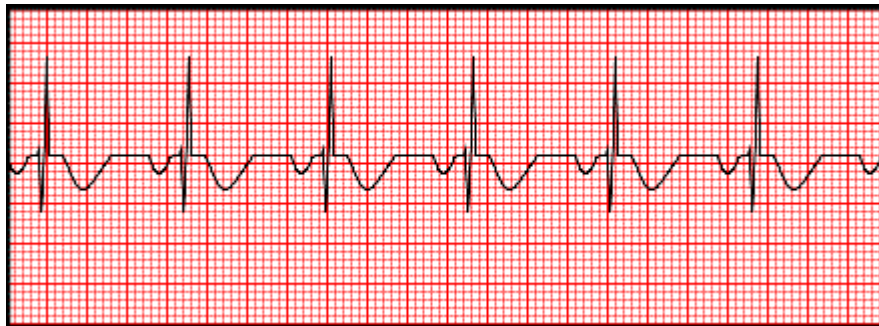


Figure 12-2 : reversed leads

AC interference

Alternating current (AC) describes the type of electricity that we get from the wall. In the United States, the electricity "changes direction" 60 times per second (i.e. 60 hertz). (Many places in Europe use 50 Hz AC electricity.) When an ECG machine is poorly grounded or not equipped to filter out this interference, you can get a thick looking ECG line (as shown in figure 12-3). If one were to look at this ECG line closely, he would see 60 up-and-down wave pattern in a given second (25 squares).

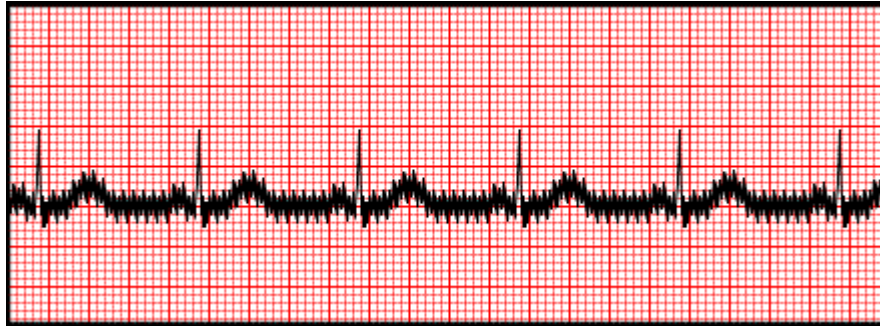


Figure 12-3 : 60 Hz AC interference

Muscle tremor / noise

The heart is not the only thing in the body that produces measurable electricity. When your skeletal muscles undergo tremors, the ECG is bombarded with seemingly random activity. The term *noise* does not refer to sound but rather to electrical interference.

Low amplitude muscle tremor noise can mimic the baseline seen in atrial fibrillation. Muscle tremors are often a lot more subtle than that shown in figure 12-4.

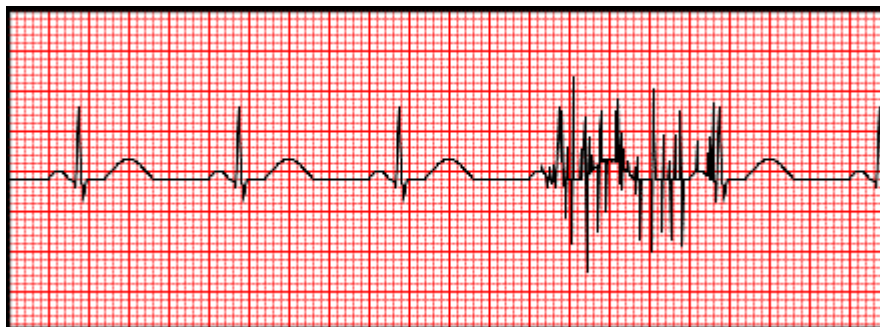


Figure 12-4 : Muscle tremors

Wandering baseline

In wandering baseline, the isoelectric line changes position. One possible cause is the cables moving during the reading. Patient movement, dirty lead wires/electrodes, loose electrodes, and a variety of other things can cause this as well.

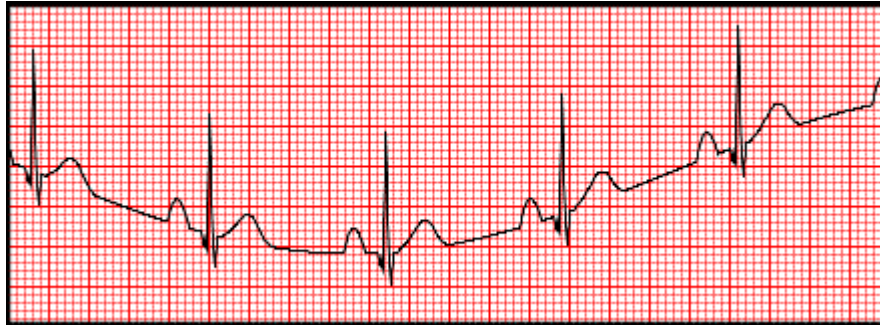


Figure 12-5 : Wandering baseline artifact

Absolute heart block

Absolute heart block (or 4th degree heart block) results from over-exposure to imported-liquor advertisements in magazines. QRS complexes are wide and bottle-shaped and show no relationship with the P wave. It occurs very rarely, and even then, only in fictional settings. This should not be confused with the real arrhythmia *complete heart block*.

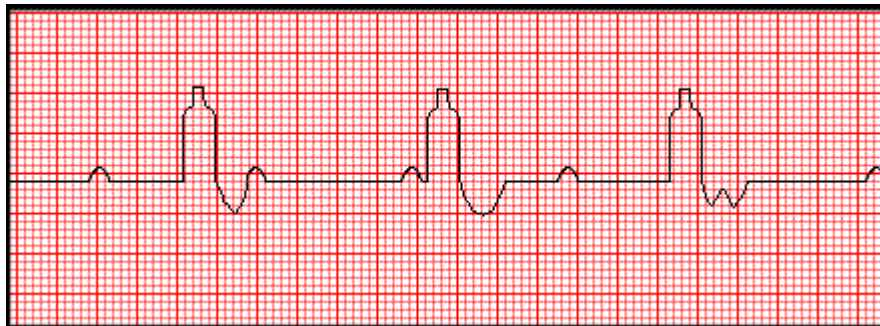
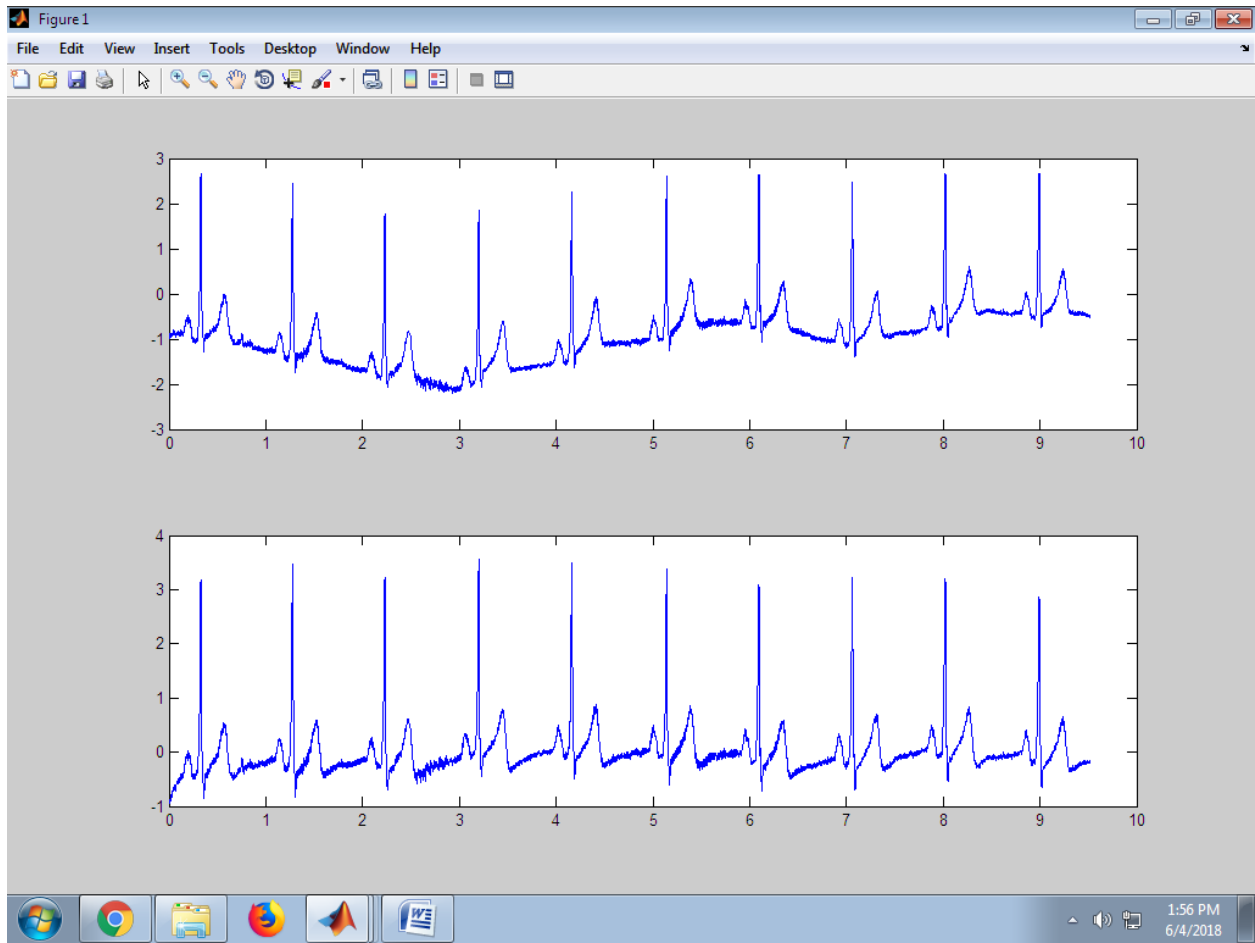


Figure 12-6 : Absolute heart block

CODE:

```
% MATLAB PROGRAM ecg_lfn.m
clear all % clears all active variables
close all

ecg = load('ecg_lfn.dat');
L=length(ecg);
fs = 1000; %sampling rate = 1000 Hz
%slen = length(ecg);
t=[1:L]/fs;
%figure
%plot(t,ecg)
%axis tight;
%xlabel('Time in seconds');
%ylabel('ECG');
b=[1,-1]
a=[1,-0.995]
figure,
t1=zplane(b,a,(1/fs))
[h,f]=freqz(b,a,L,fs);
%subplot(211)
%plot(f,abs(h))
[ph,f]=phasez(b,a,L,fs)
%subplot(212)
%plot(f,ph)
out=filter(b,a,ecg);
subplot(211)
plot(t,ecg);
subplot(212)
plot(t,out);
E_ref=sum(out.^2);
noise=ecg-out;
E_noise=sum(noise.^2);
SNR=10*log10(E_ref/E_noise)
```



```

% MATLAB PROGRAM ecg_lfn.m
clear all % clears all active variables
close all

ecg = load('ecg_lfn.dat');
L=length(ecg);
fs = 1000; %sampling rate = 1000 Hz

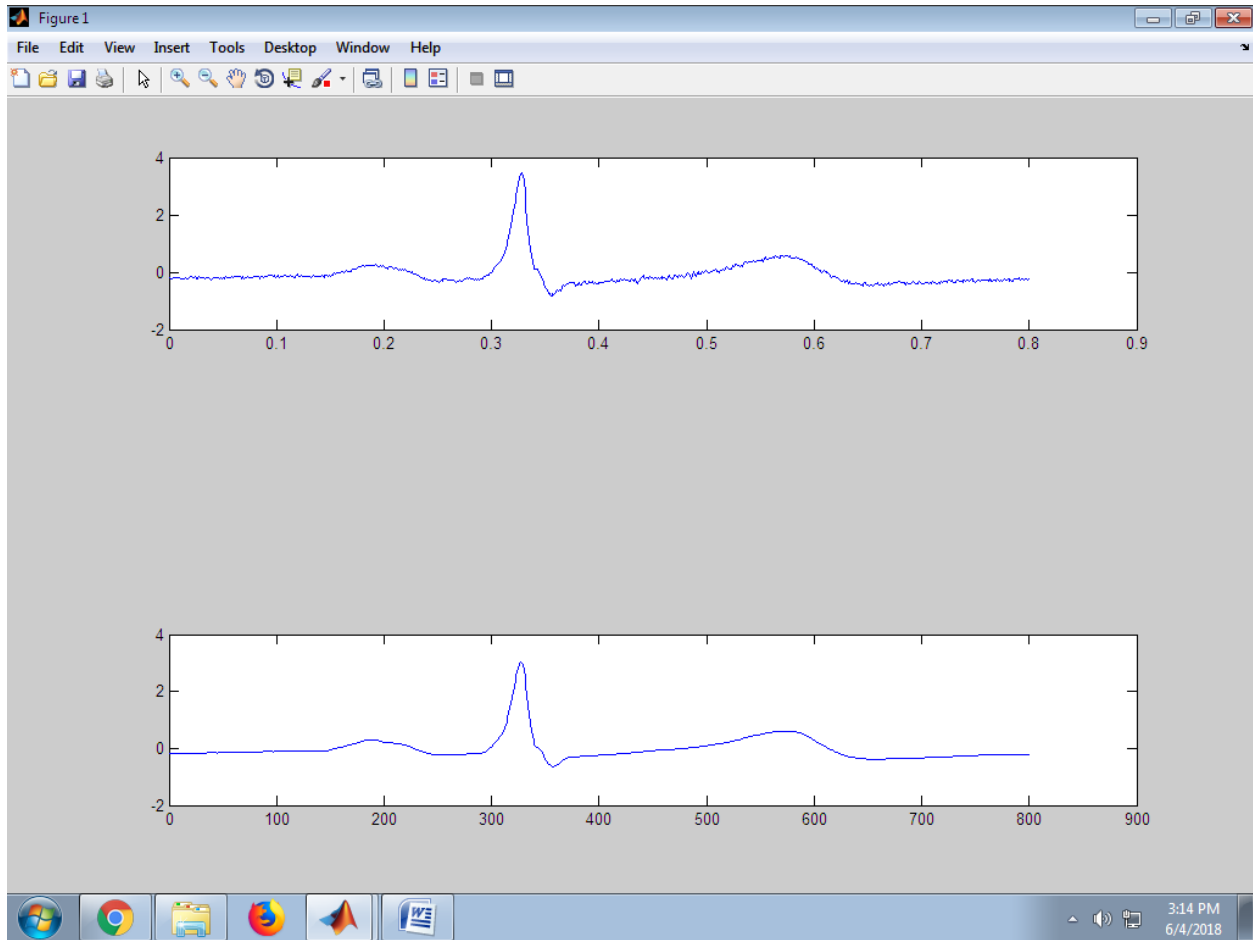
%slen = length(ecg);
t=[1:L]/fs;
%figure
%plot(t,ecg)
%axis tight;
xlabel('Time in seconds');
ylabel('ECG');
b=[1,-1]
a=[1,-0.995]
figure,
t1=zplane(b,a,(1/fs))
[h,f]=freqz(b,a,L,fs);
%subplot(211)
%plot(f,abs(h))
[ph,f]=phasez(b,a,L,fs)
%subplot(212)
%plot(f,ph)
out=filter(b,a,ecg);
%subplot(211)
%plot(t,ecg);
%subplot(212)
%plot(t,out);
temp_start=950;
L_temp=801;
temp=out(temp_start:(temp_start+L_temp-1));
t2=(1:L_temp)/fs
subplot(311)
plot(t2,temp);
n=floor(L_temp/2);
x1=[zeros(n,1);out;zeros(n,1)]
for i=1:length(out)
    prod=temp.*x1(i:i+L_temp-1);
    cross_corr(i)=sum(prod)/(norm(temp)*norm(x1(i:i+L_temp-1)));
end
%subplot(312)
%plot(t,cross_corr);
noisy_ecg=cross_corr;
threshold=0.9;
idx=find(cross_corr > threshold);
for i=1:length(idx)-1
    if ((idx(i)-n)>=1)&&((idx(i)+n)<=length(out))
        sync_avg1(i,:)=out(idx(i)-n:idx(i)+n);
    end
end
sync_avg=mean(sync_avg1);
subplot(313)
plot(sync_avg);
E_ref=sum(sync_avg.^2);

```

```
noise=sync_avg-(temp)';  
E_noise=sum(noise.^2);  
SNR=10*log10(E_ref/E_noise)
```

SNR =

14.5169



PROPOSAL FOR CONSULTANCY

Proposed Equipment for usage:

A program/machine/product of utility may be proposed to develop for in house usage/Industrial requirements may be useful for any outside agency that can be marketable in order to generate revenue through consultancy.

Design and Simulation of (OFDM) Signaling

Abstract:

A MATLAB program has been written to investigate Orthogonal Frequency Division Multiplexing (OFDM) communication systems. This program is valuable for future researchers simulating systems that are too theoretically complex to analyze. Single-carrier QAM and multi-carrier OFDM are compared to demonstrate the strength of OFDM in multipath channels. Two graphical user interface demonstrations show some of the basic concepts of OFDM.

Introduction

The Electrical Engineering Senior Capstone Project is intended to give each student experience in completing a sophisticated design project that spans most of the senior year. Planning, management of time, allocation of responsibility, documentation, and presentation of the results are integrated with the technical design task. The students work with one or two faculty advisors who have expertise in the project research area. The student is fully responsible for the design project, with the advisor(s) acting as guide and mentor. Each student is expected to work an eight-hour lab period each week from October through May.

A common problem found in high-speed communication is inter-symbol interference (ISI). ISI occurs when a transmission interferes with itself and the receiver cannot decode the transmission correctly. For example, in a wireless communication system such as that shown in Figure 1, the same transmission is sent in all directions.

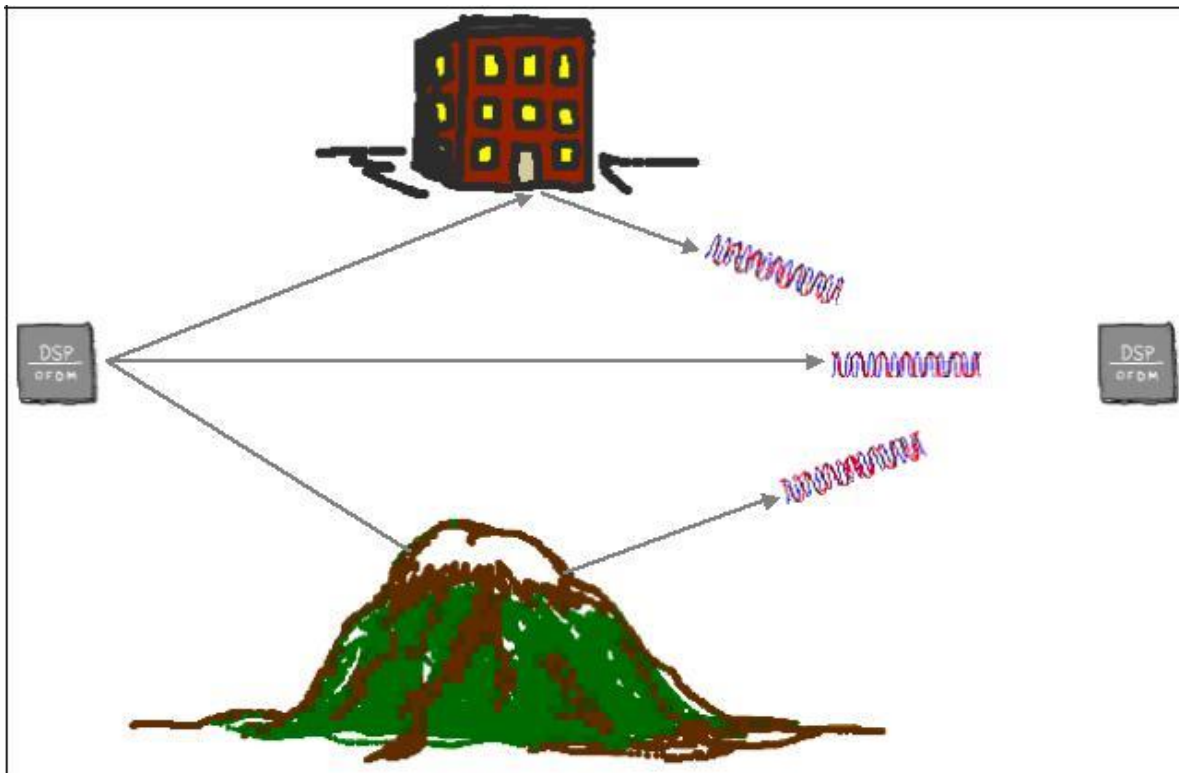


Figure 1: Multipath Demonstration

Because the signal reflects from large objects such as mountains or buildings, the receiver sees more than one copy of the signal. In communication terminology, this is called multipath. Since the indirect paths take more time to travel to the receiver, the delayed copies of the signal interfere with the direct signal, causing ISI.

Theory

This project will focus on Orthogonal Frequency Division Multiplexing (OFDM) research and simulation. OFDM is especially suitable for high-speed communication due to its resistance to ISI. As communication systems increase their information transfer speed, the time for each transmission necessarily becomes shorter. Since the delay time caused by multipath remains constant, ISI becomes a limitation in high-data-rate communication [1]. OFDM avoids this problem by sending many low speed transmissions simultaneously. For example, Figure 2 shows two ways to transmit the same four pieces of binary data.

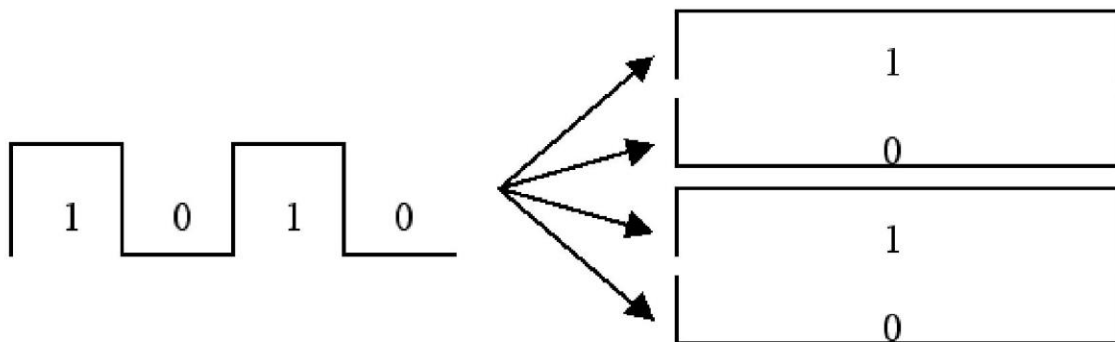


Figure 2: Traditional vs. OFDM Communication

Suppose that this transmission takes four seconds. Then, each piece of data in the left picture has a duration of one second. On the other hand, OFDM would send the four pieces simultaneously as shown on the right. In this case, each piece of data has a duration of four seconds. This longer

duration leads to fewer problems with ISI. Another reason to consider OFDM is low-complexity implementation for high-speed systems compared to traditional single carrier techniques [2].

Significance

With the rapid growth of digital communication in recent years, the need for high-speed data transmission has increased. New multicarrier modulation techniques such as OFDM are currently being implemented to keep up with the demand for more communication capacity. Multicarrier communication systems “were first conceived and implemented in the 1960s, but it was not until their all-digital implementation with the FFT that their attractive features were unraveled and sparked widespread interest for adoption in various single-user and multiple access (MA) communication standards” [2]. The processing power of modern digital signal processors has increased to a point where OFDM has become feasible and economical. Examining the patents, journal articles, and books available on OFDM, it is clear that this technique will have an impact on the future of communication. See the references section (starting on page 21) for a condensed bibliography and list of patents related to this topic. Since many communication systems being developed use OFDM, it is a worthwhile research topic. Some examples of current applications using OFDM include GSTN (General Switched Telephone Network), Cellular radio, DSL & ADSL modems, DAB (Digital Audio Broadcasting) radio, DVB-T (Terrestrial Digital Video Broadcasting), HDTV broadcasting, HYPERLAN/2 (High Performance Local Area Network standard), and the wireless networking standard IEEE 802.11 [1] [3] [4].

Simulation Design

This project consists of research and simulation of an OFDM communication system.

Figure 3 shows a simplified flowchart of the MATLAB simulation code.

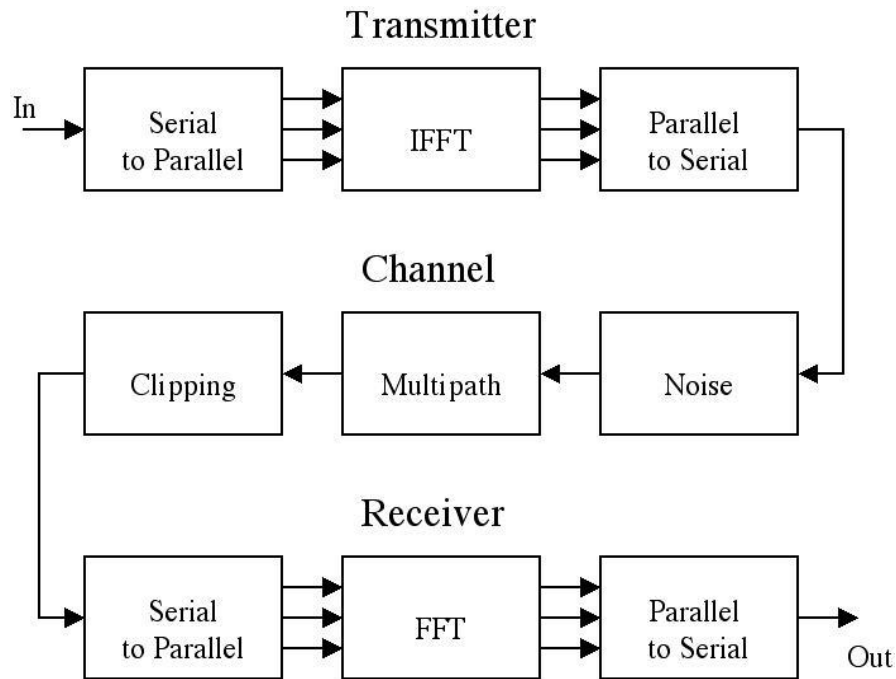


Figure 3: OFDM Simulation Flowchart

The transmitter first converts the input data from a serial stream to parallel sets. Each set of data contains one symbol, S_i , for each subcarrier. For example, a set of four data would be $[S_0 S_1 S_2 S_3]$. Before performing the Inverse Fast Fourier Transform (IFFT), this example data set is arranged on the horizontal axis in the frequency domain as shown in Figure 4.

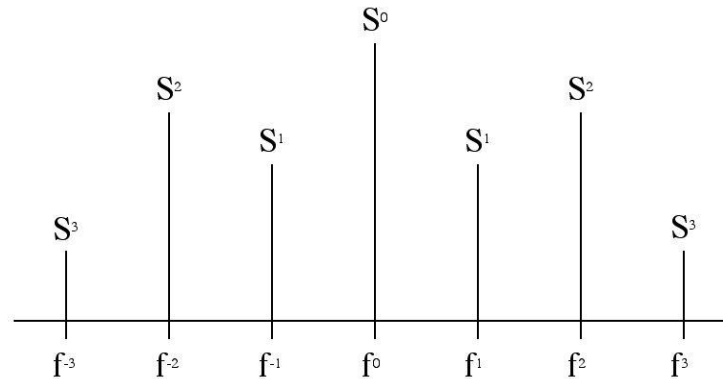


Figure 4: Frequency Domain Distribution of Symbols

This symmetrical arrangement about the vertical axis is necessary for using the IFFT to manipulate this data. An inverse Fourier transform converts the frequency domain data set into samples of the corresponding time domain representation of this data. Specifically, the IFFT is useful for OFDM because it generates samples of a waveform with frequency components satisfying orthogonality conditions. Then, the parallel to serial block creates the OFDM signal by sequentially outputting the time domain samples.

The channel simulation allows examination of common wireless channel characteristics such as noise, multipath, and clipping [5]. By adding random data to the transmitted signal, simple noise is simulated. Multipath simulation involves adding attenuated and delayed copies of the transmitted signal to the original. This simulates the problem in wireless communication when the signal propagates on many paths. For example, a receiver may see a signal via a direct path as well as a path that bounces off a building. Finally, clipping simulates the problem of amplifier saturation. This addresses a practical implementation problem in OFDM where the peak to average power ratio is high.

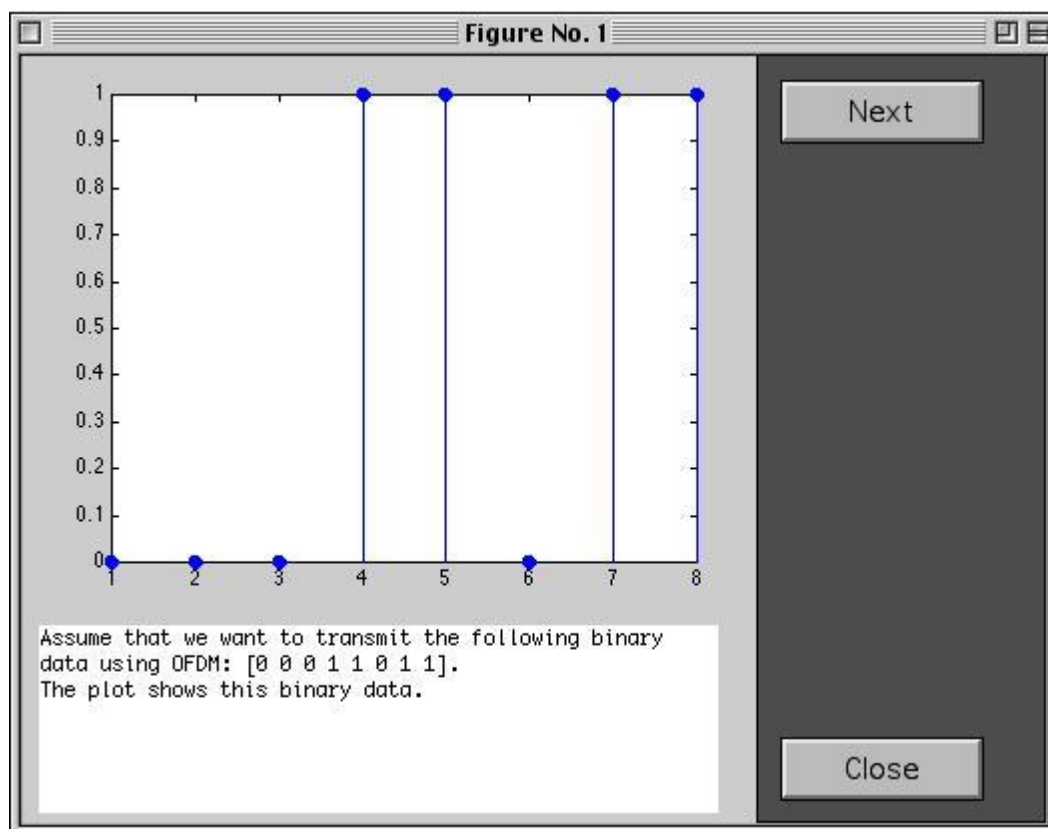
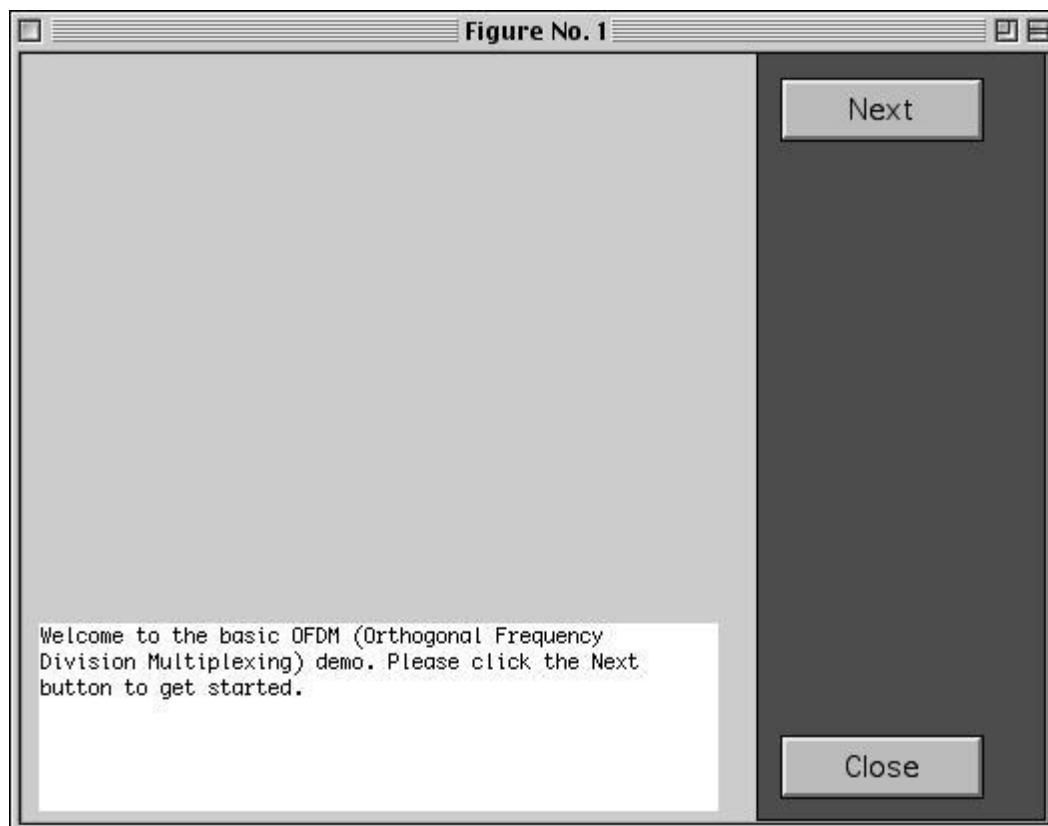
The receiver performs the inverse of the transmitter. First, the OFDM data are split from a serial stream into parallel sets. The Fast Fourier Transform (FFT) converts the time domain samples back into a frequency domain representation. The magnitudes of the frequency

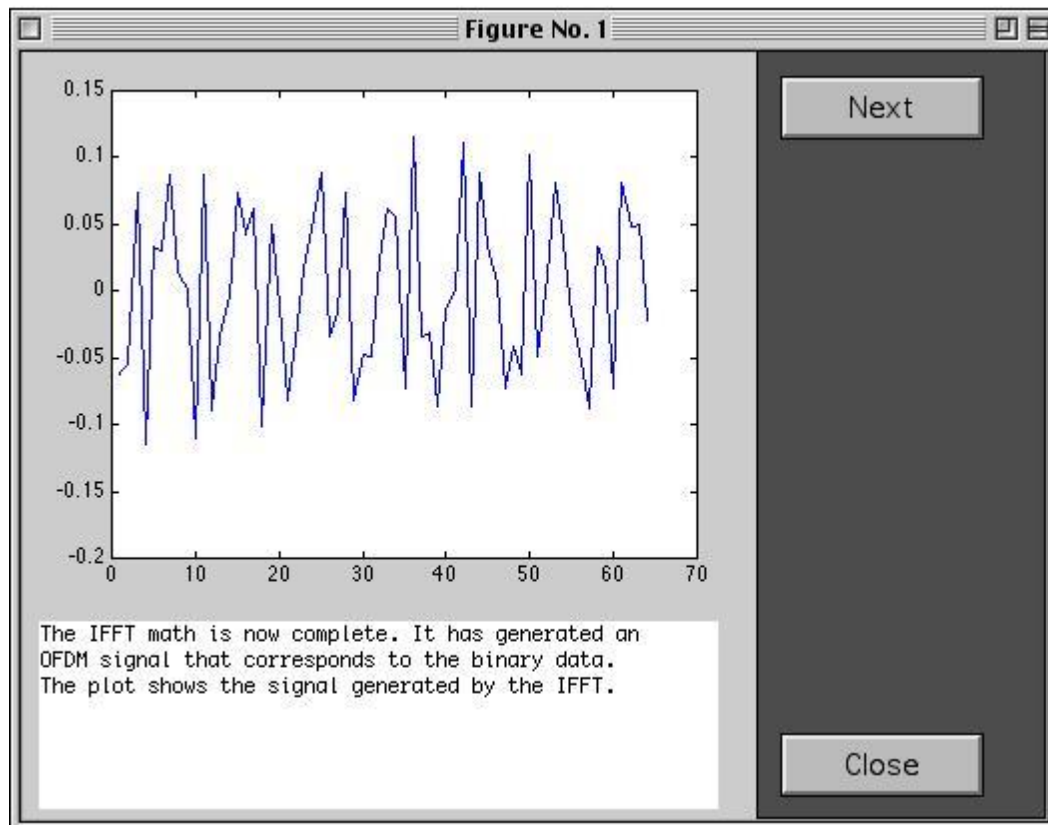
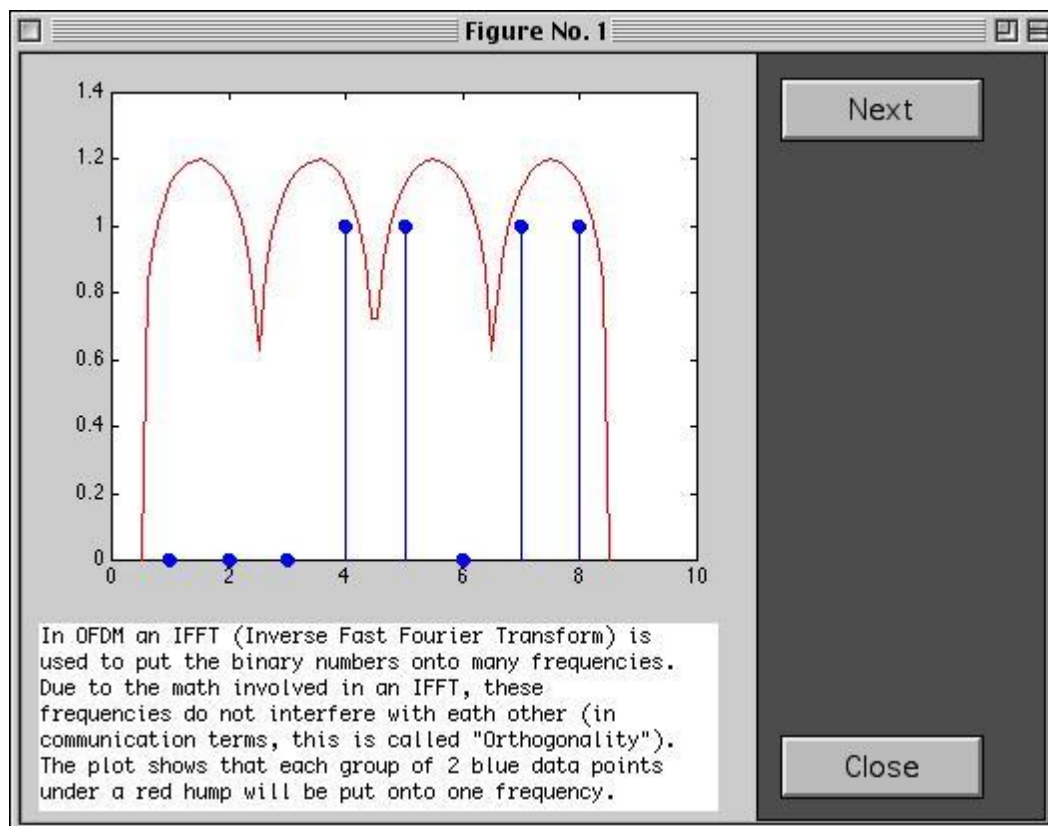
components correspond to the original data. Finally, the parallel to serial block converts this parallel data into a serial stream to recover the original input data.

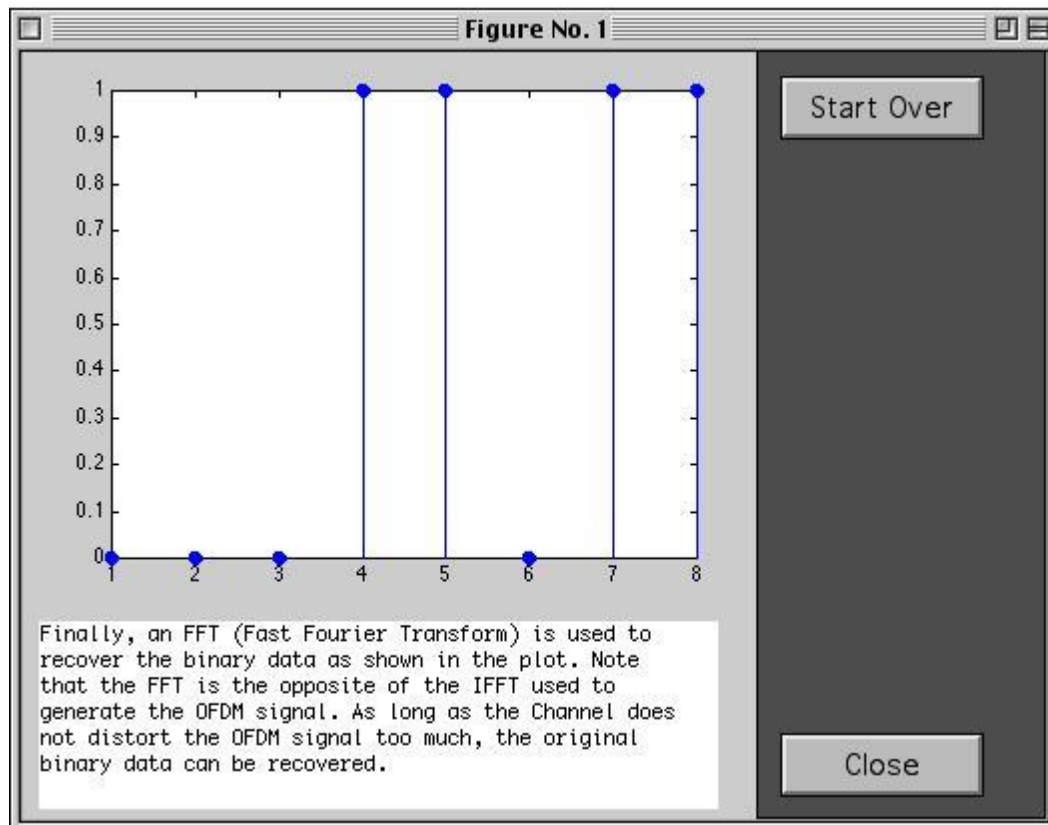
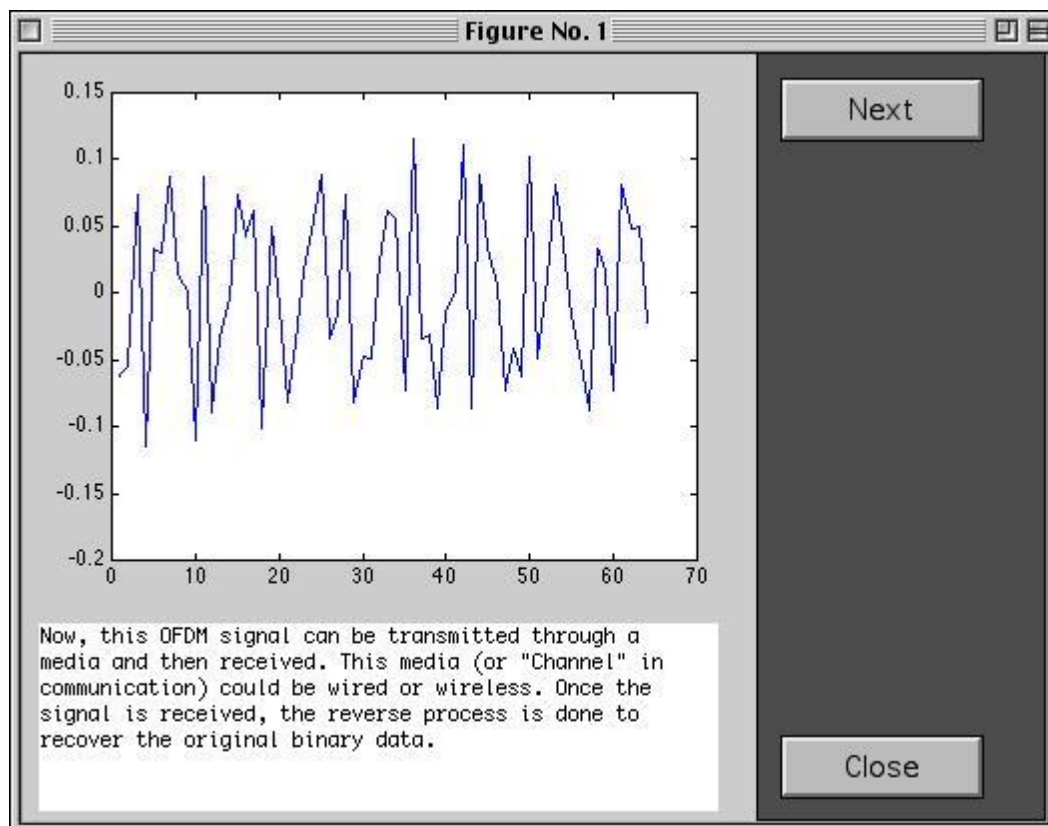
Results

The MATLAB simulation accepts inputs of text or audio files as well as binary, sinusoidal, or random data. It then generates the corresponding OFDM transmission, simulates a channel, attempts to recover the input data, and performs an analysis to determine the transmission error rate. In order to compare OFDM to a traditional single carrier communication system, a 16-QAM simulation can be performed. These simulations are dynamic, allowing the user to set parameters determining the characteristics of the communication system. Two simple demonstrations of OFDM communication were developed with a graphical user interface (GUI) following the style of MATLAB toolbox demonstrations. These allow someone to quickly learn the basic concepts of OFDM communication.

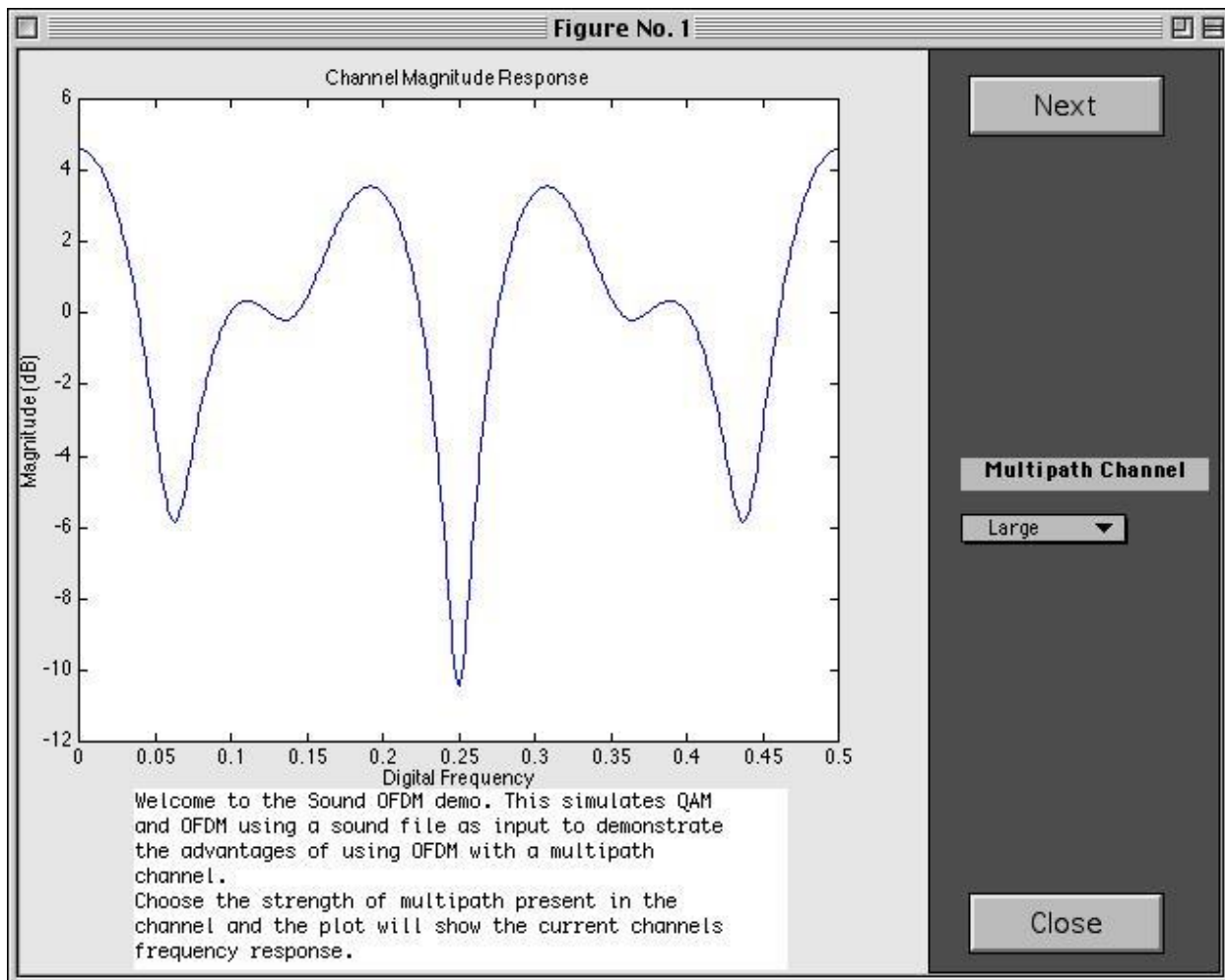
The first demonstration, basicgui (or basicgui_win), introduces the process of creating an OFDM symbol. It shows a simple example of using the Fourier transform to send binary data on four frequencies. The following screenshots show the demo sequence with explanations in the text box.

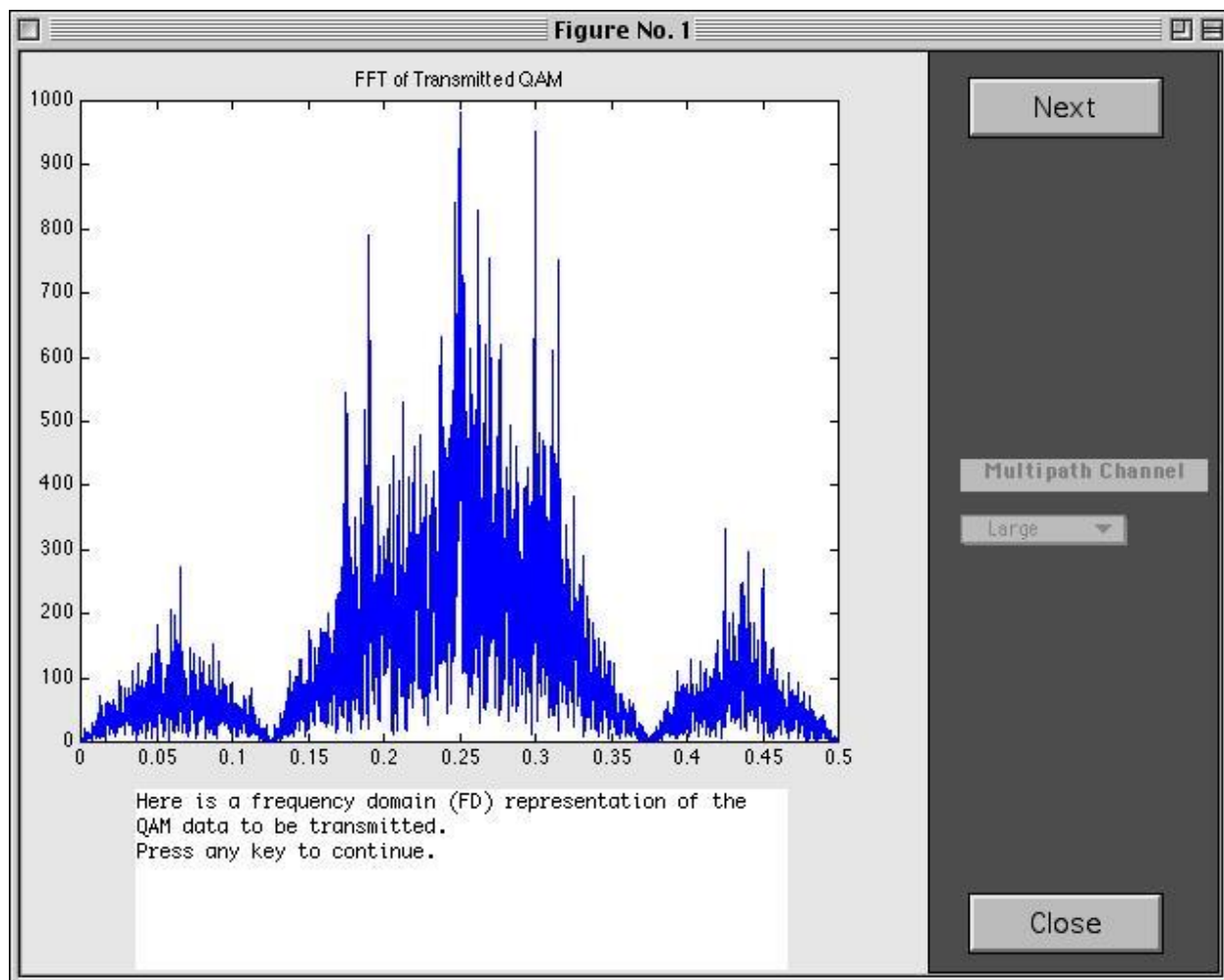


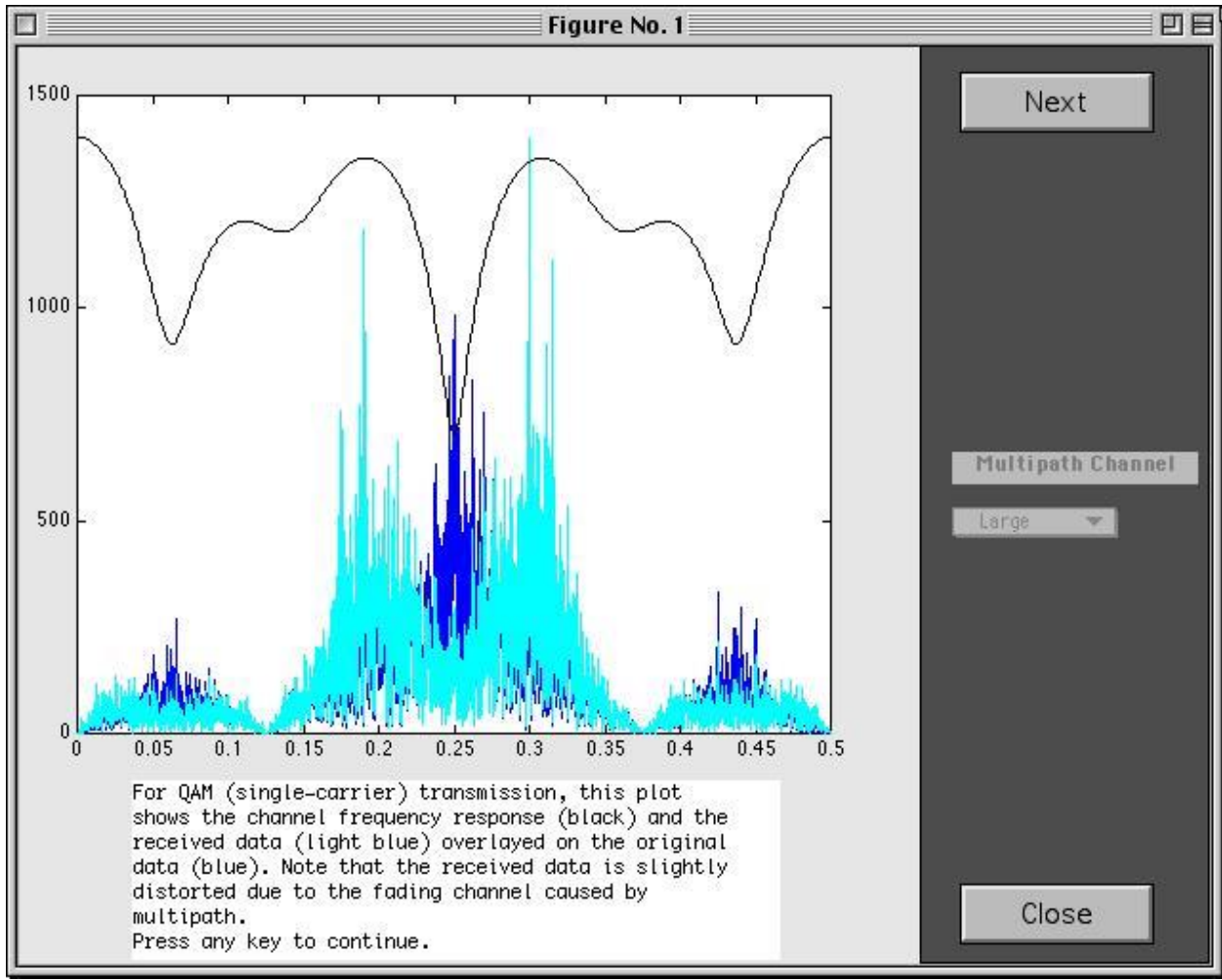


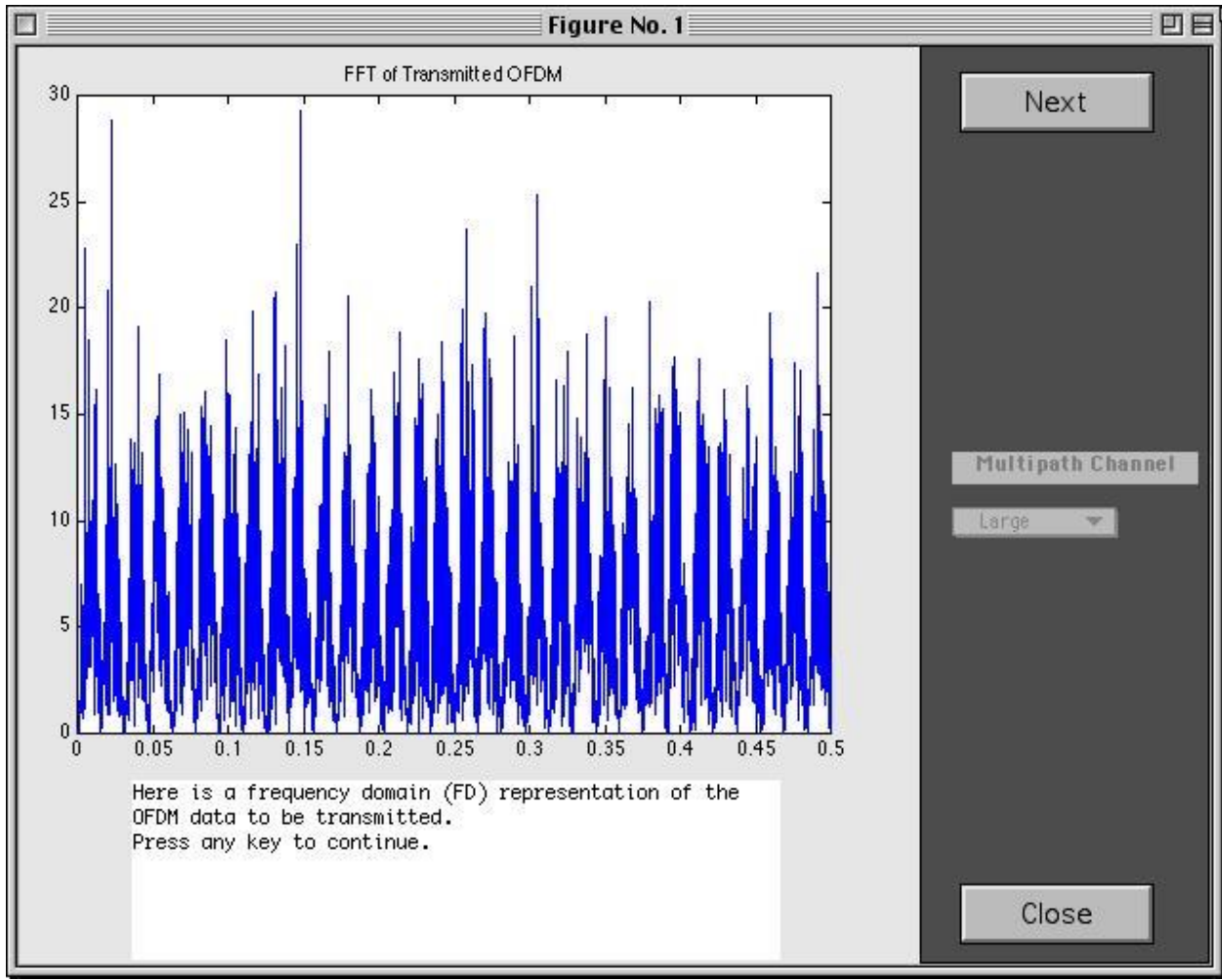


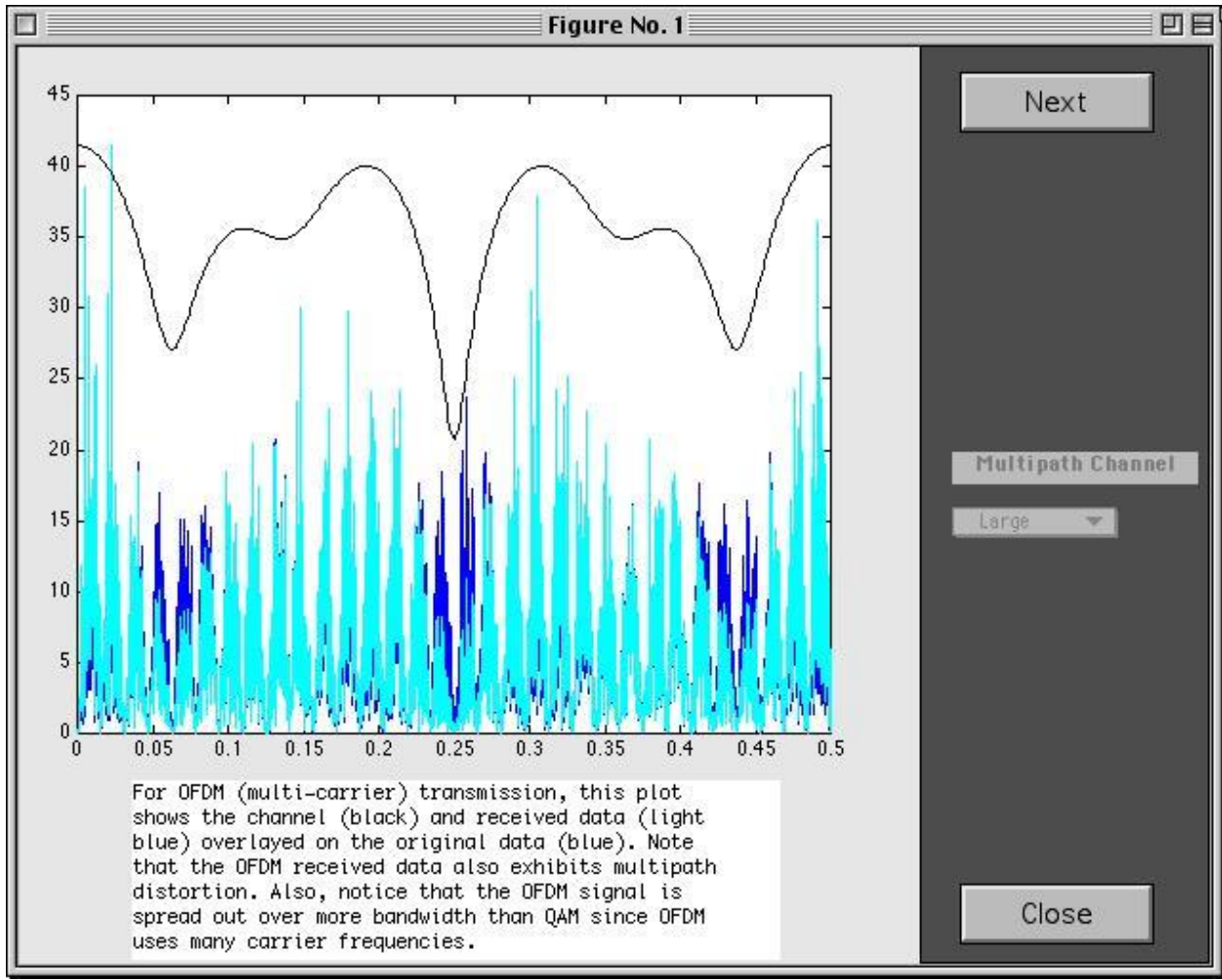
The second demonstration, soundgui (or soundgui_win), gives a more technical example. It compares OFDM to 16-QAM in a multipath channel. The user can choose no, small, or large amount of multipath. The following screenshots show the demo sequence with explanations in the text box.

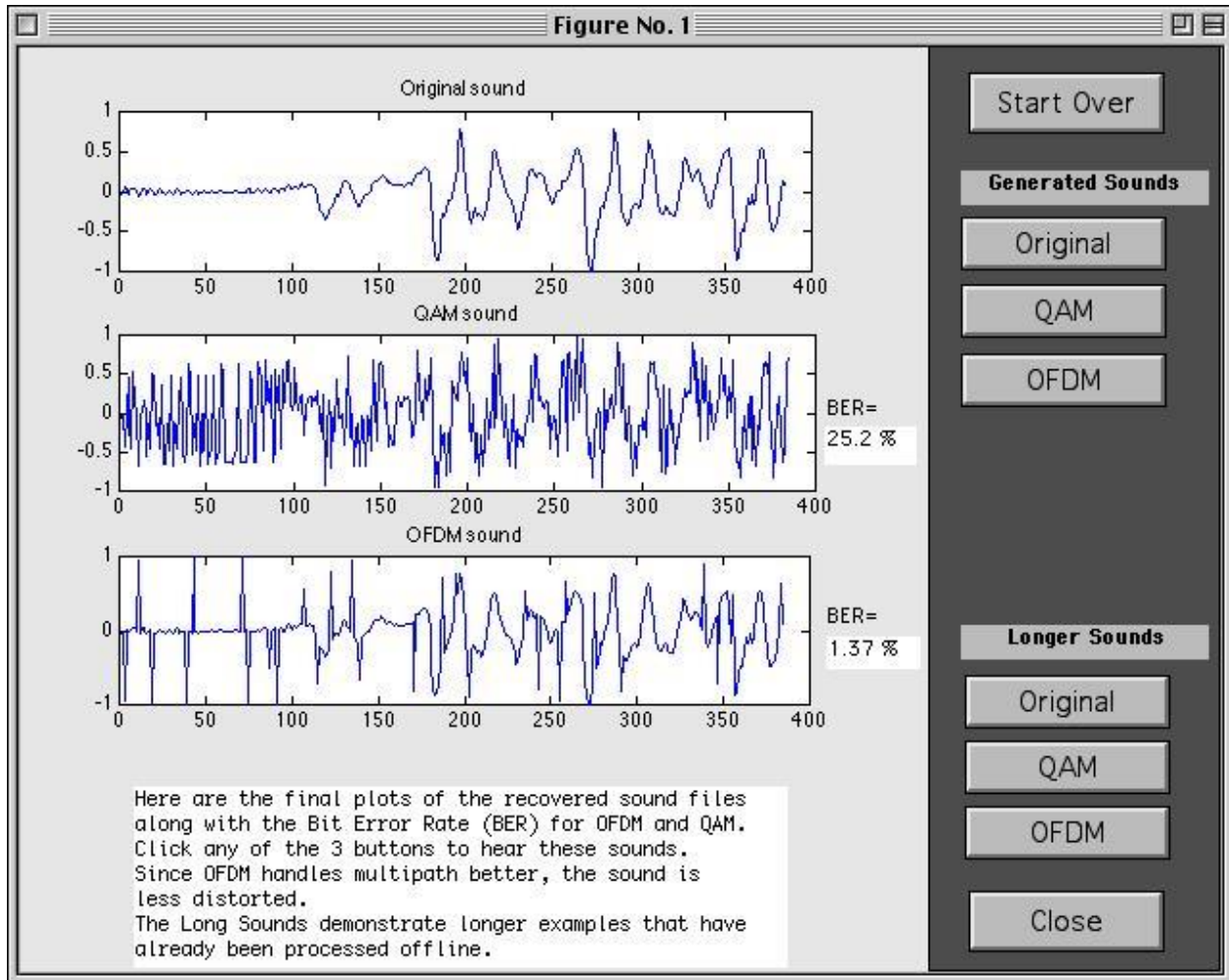












The two GUI demonstrations utilize the complete simulation code, but not all of its capabilities. By modifying the `setup.m` m-file, users can adjust parameters such as the `fft_size`, `num_carriers`, input types, and channel characteristics. It also allows detailed analysis of the communication system. Plots showing OFDM input and output, 16-QAM input and output, and the received 16-QAM signal constellation are generated. See Figures 5, 6, and 7 for examples of these plots.

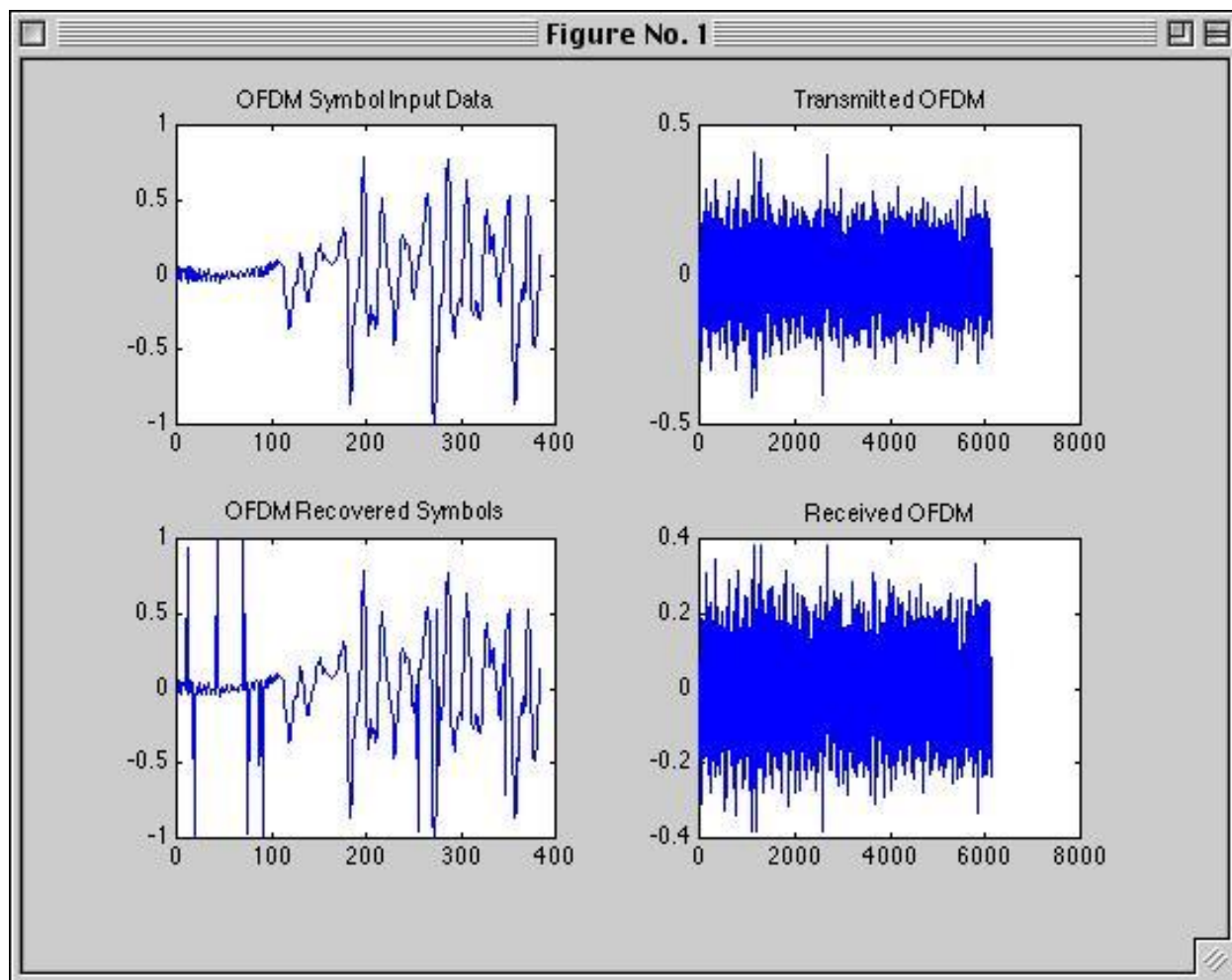


Figure 5: OFDM Input and Output

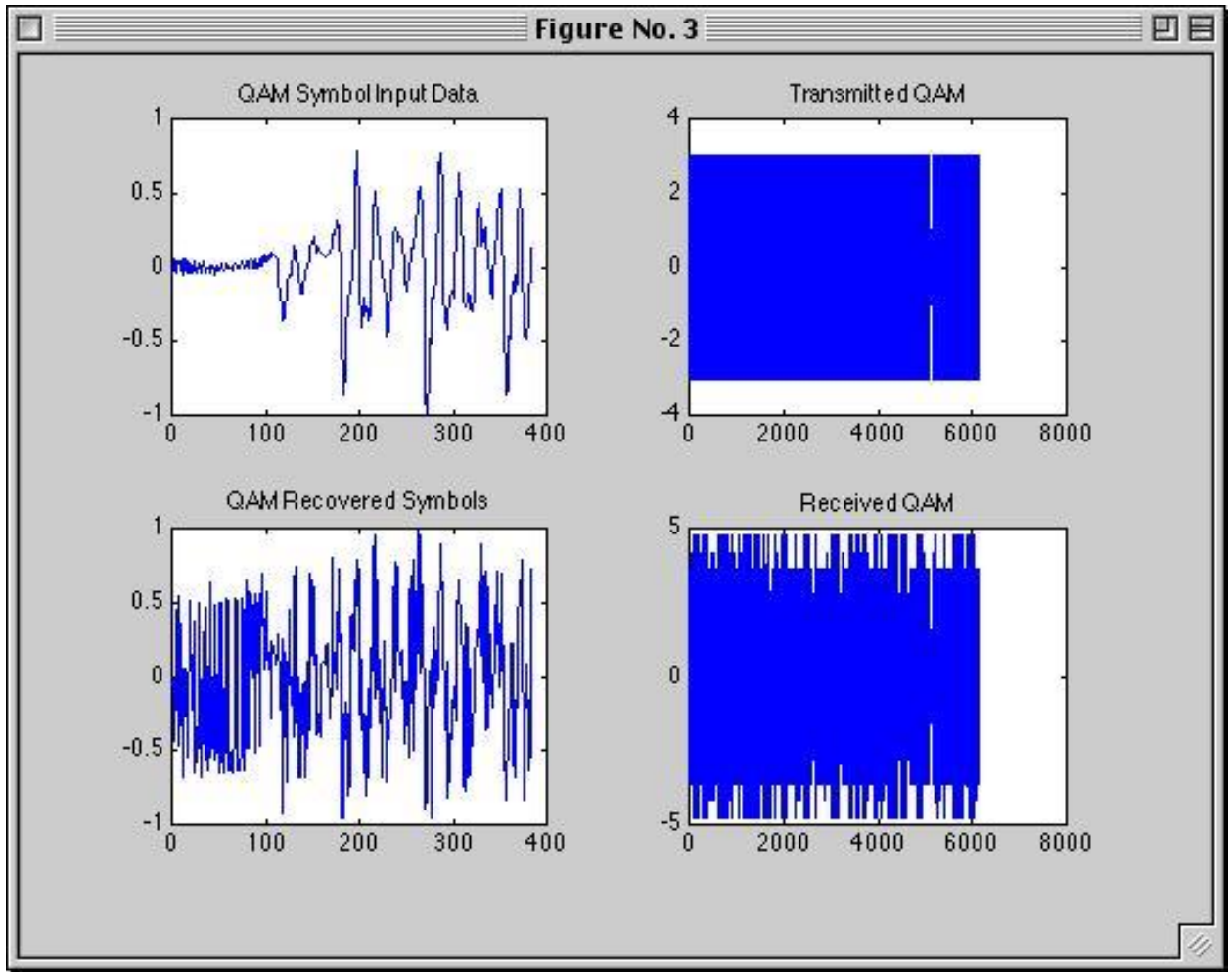


Figure 6: 16-QAM Input and Output

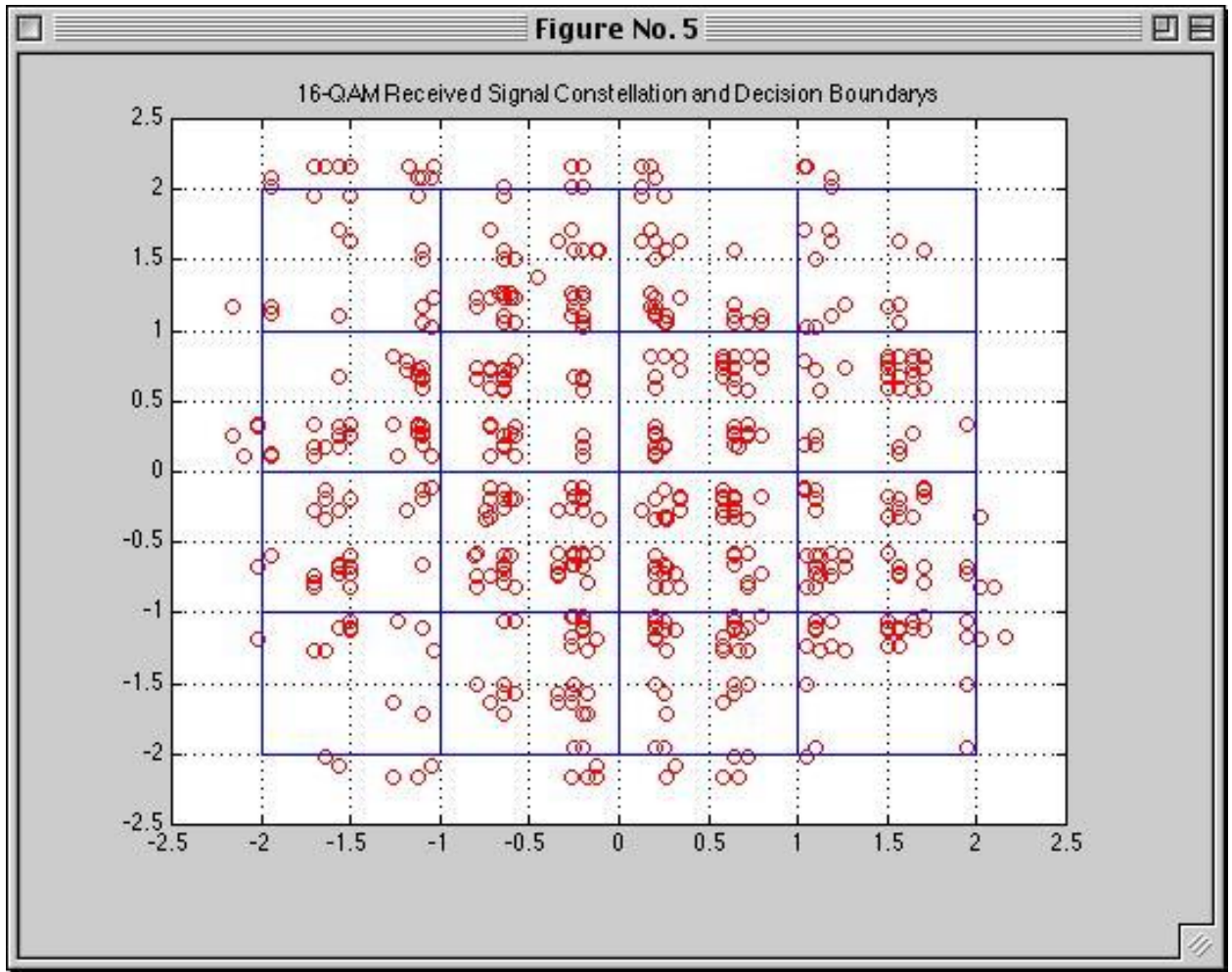


Figure 7: Received 16-QAM Signal Constellation

Depending on the input type chosen, appropriate output files are created. This enhances the numerical error analysis by showing how the errors degrade the data being transmitted. For one test, the preamble of the US constitution was transmitted. Figure 8 shows the results.

| <p><i>The Original Data</i></p> | <p><i>OFDM transmission</i> Bit Error Rate = 0.0699% Binary Errors = 4</p> | <p><i>16-QAM transmission</i> Bit Error Rate = 23.0% Binary Errors = 1,315</p> |
|---|--|--|
| <p>IN CONGRESS, July 4, 1776.</p> <p>The unanimous Declaration of the thirteen united States of America,</p> <p>When in the Course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.</p> <p>We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.</p> | <p>IN CONGRESS, July 4, 1776.</p> <p>The unanimous Declaration of the thirteen united States of America,</p> <p>When in the Course of human events, it becomes necessary for one people to dissolve the political baods which have connected the l with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.</p> <p>We hold these truÛhs to be self-evident, that all meo are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.</p> | <p>JO\$ie_BÜSE\4ðtl8\$<4tz*).__x u\$Ÿn!Æ)m/\$rTücu1±°Ÿyo_ \$ø_ \$Ÿ xu\$ŸxyqŸuen\$Ÿn)tud4£\$qŸurTø_ \$ i≠%q©cël__Xun\$ πn\$Ÿxu\$ü\$Ÿq≤ī \$ø_ \$Πtm!Æ\$μuen4r\4 πt4≤•cü_%r Tæ%çirçē± Π\$ðo!dø_%_0mo °5\$Ÿ_Ÿyrçü_5e\$Ÿxu\$ ∞ø_9tycē"4 ≤°Æ\$Rt∂Xycò4 Πque\$ ≥ü_ .%çšud 4Ÿxum_6Ytx4±Æ/\$xuq14±Æ\$4Ÿ ± ≤ç\$m%\$± ≠/ ' Ÿxu\$∞ø&Uq≤Tø _\$Ÿxu\$μa±Ÿx<4Ÿxu_2ip±°Ÿu\$± Æ\$4μpŸa"4 ≤\$qŸyo_ \$Ÿ_ ∂Xycò4Ÿ xu\$ùl ∂bTø_ \$ü!Ÿtq•\$±Æ\$4ø__!Ÿt q•+bTó_ 4μn4yt 5\$Ÿxum,4±dŸuci n44±•r†μç\$4Ÿ_ Ÿxu\$ø πn)o_2Tø_ - !Æ+Ÿn\$4±•pŸiq•rTŸxqŸ4Ÿxux\$ ≤ò \$!44Ÿucú1±•\$Ÿxu\$ ≥èŸrîrT∂Xycò 4πm0μl_4xum\$Ÿ_ Ÿxu\$ ≤_çp±°Ÿy o_ .__U\$Π_44Ÿxuri\$ŸqŸtxrTŸ _≤•\$≤il6 %uidun4<4ŸxqŸ4±" <4 Ω°n\$±±•\$ ≥ °•aŸud_ %pŸa" <4ŸxqŸ4Ÿxux\$±±•\$ μn\$ &Ud4 ≤Π\$Ÿxuiqdi°•aŸ !d ∂Y tx4≥iqŸq©n\$Ÿn!"9en!ç"5__çgXtr\ 4ŸxqŸ4± ≠/ ' Ÿxuri\$±±•\$ù9fe,4ù9b •qŸx\$±Æ\$4Ÿxu\$ ∞Ÿq≤\$it4ø_ \$òq ∞ ∞πn%rç^_f</p> |

Figure 8: Text Example Comparing OFDM to 16-QAM

OFDM transmission had a very low bit error rate of 0.0699% so only four errors were caused by the multipath channel. 16-QAM incurred a 23.0% bit error rate. Since a character is represented by eight bits, every character had two bits in error on average. This resulted in unintelligible received text.

A second test using an audio file produced similar results. The difference is that users can see and hear the degradation caused by binary errors. Figure 9 shows plots of the audio files.

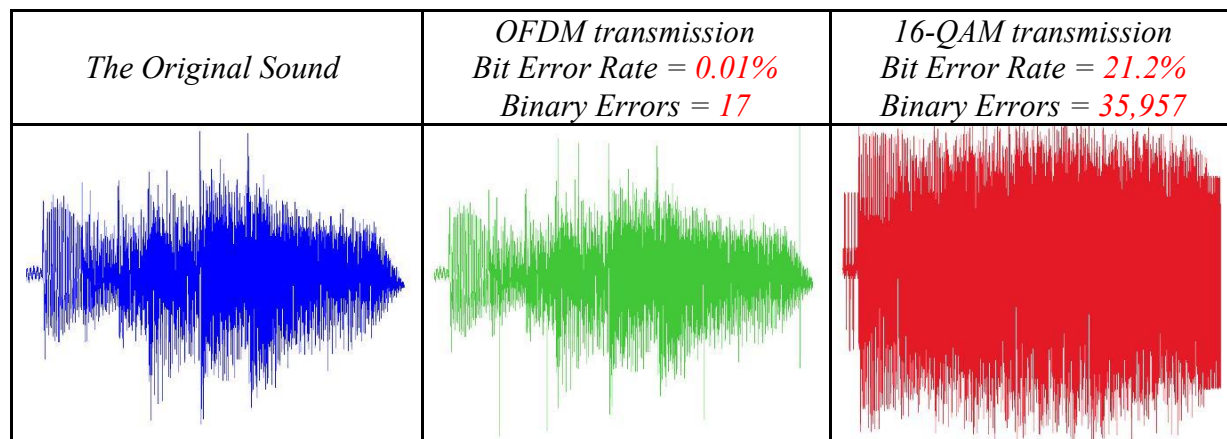


Figure 9: Audio Example Comparing OFDM to 16-QAM

In this case, the original sound is a guitar plucking a chord. The OFDM sound contains audible “clicks” due to bit errors and the waveform is similar to that of the original sound. The 16-QAM sound’s waveform does not resemble the original and listening to the 16-QAM sound confirms this. The original guitar chord is barely discernable underneath loud static noise.

Conclusion

This MATLAB simulation proves that OFDM is better suited to a multipath channel than a single carrier transmission technique such as 16-QAM. This program is available on the Bradley University Electrical Engineering Department web page at <http://cegt201.bradley.edu/projects/proj2001/ofdmabsh/>.

Future research may be based on this project. These extensions may include channel phase shift detection and correction, error correction by coding, adaptive transmission, peak to average power ratio considerations, and DSP implementation.

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- Q. Lawrey, Eric. OFDM Wireless Technology. 11 May 2000. 7 Nov. 000. <http://www.eng.jcu.edu.au/eric/thesis/Thesis.htm>

FUNDED/ UNFUNDED PROPOSALS:

The proposal for Two Weeks Embedded Systems Faculty Development Programme (FDP) under AICTE grants is applied and waiting for its approval.

OBJECTIVE:

The proposals for AICTE grants like UGC grants, DST CPRI and other funding agencies by giving Title and abstract/objective OR Self Funded program proposals may be submitted for Management approvals.

Proposal for Seminar Grant:

TITLE: Seminar on Hardware Design Of DSP Systems

OBJECTIVE: This seminar is intended to bring down the awareness among students and staff in order to study the hardware design of DSP systems.

13. PROPOSALS (WEEK WISE INDUSTRIAL VISITS) (IN HOUSE OR OUTSIDE VISIT)/TRAINING PROGRAMMES:

TABLE 1: INDUSTRIAL VISITS

As of now no industrial visits is proposed.

| S. No | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | Remarks |
|-------|-----------------------|--|---------------|------------------------------|-------------|---------|
| 1 | Dsp Group, Inc | TeakDSPCore, D6000 Family ICs | 20-1-2015 | 90 | III-II ECE | |
| 2 | DRS Technologies | ICs like Cheetah PMC | 25-2-15 | 90 | III-II ECE | |

**TABLE 2: INDUSTRIAL TRAINING (Shadow Engineering)
(Career Visit Approval)**

Three day training on Custom IC design using 45 nm technologies is proposed at CDAC, Hyderabad.

| S.No | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/Certificate No. | Remarks |
|------|--------------------|--------------------|----------------------|-----------|----------------------------------|---------|
| | | | | | | |

GUIDELINES FOR SHADOW ENGINEERING (VIP)

INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM):

OBJECTIVES OF SHADOW ENGINEERING:

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future assignments.
4. This program leads to matrixing with the students.

14. CALIBRATION/INSTALLATION AND TESTING:

CALIBRATION: Aim of this concept is to check,

- i. Whether all the equipment is functioning correctly as per the standards
- ii. To bring correctness in the errors of instrument or equipment
- iii. To rectify the errors if any

INSTALLATION: Aim of this concept is to make and maintain installation procedure for a new equipment or already existing equipment.

TESTING: Aim of this concept is to test the equipment after installation whether it meets the existing standards.

Case 1: Calibration of Equipment

| S.No | Type of equipment | Certificate No | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|------|-------------------|----------------|-----------------------|---------------------|-------------------------|---------|
| | | | | | | |
| | | | | | | |

Procedure for Installation:

Mat lab Installation:

STEPS: Installation of MATLAB Software for window XP/VISTA / Windows 7/8

Get administrator privileges for the system on which you plan to install MATLAB.

Use WinRAR to extract RAR file

Step1: Start the installer for Windows, double-clicking on setup.exe

Step 2: Choose to Install Without Using the Internet

When it starts, the installer displays the following dialog box. Select the Install without using the Internet option and Click OK to proceed with installation.

Step 3: Review the License Agreement

Review the software licensing agreement and, if you agree to its terms, click Yes.

Step 4: Enter the File Installation Key

Enter your File Installation Key and Click OK.

Step 5: Choose the Installation Type

In the Installation Type dialog box, specify whether you want to perform a Custom

Installation and click next.

Step 6: Specify the Installation Folder Specify the name of the folder where you want to install MathWorks products. Accept the default installation folder or click Browse to select a different one. If the folder doesn't exist, the installer creates it.

Step 7: Specify Products to Install (Custom Only)

Leave it by default and continue.

Step 8: Specify the Location of the License File.

Enter the full path of your License File in the text box (or drag and drop the file) and Click Next.

Step 9: Specify Installation Options (Custom Only)

After selecting installation options, click next to proceed with the installation.

Step 10: Confirm Your Choices and Begin Copying Files

Before it begins copying files to your hard disk, the installer displays a summary of your installation choices. To change a setting, click back. To proceed with the Installation, click Install. As it copies files to your hard drive, the installer displays a status dialog box to show the progress of the installation.

Step 11: Complete the Installation.

Case 3: Testing of Equipment

15. MAINTAINANCE AND TROUBLESHOOTING:

(A)TROUBLE SHOOTING SCHEDULES:

(A)Maintenance:

Maintenance and trouble shooting of equipment in a laboratory must follow the following guidelines:

Maintenance Schedules:

- (1) Preventive Maintenance Schedules of lab will be decided by lab in charge along with concerned HOD. The details of schedule should be recorded in the following template of format.

| S. No. | Name of the Equipment | Date of Maintenance | Type of Activity | Remarks |
|--------|-----------------------|---------------------|---------------------|---------|
| 1 | DSP kit | | Checking of working | |
| | | | | |

- (2) Maintenance Reports duly signed by in charges as well as HODs and duly approved by Principal periodically.

(B) TROUBLE SHOOTING SCHEDULES:

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.

S. No., Equipment Name , Type of Problem (Too much Noise, Abnormal Sound, Corrupt Software, Anti Virus Problem, Missing of Display, CRT not working, Motor is not giving signal, Digital display is not working, Break of tools, Misalignment of machine elements,

PLC is not properly working), Expected Reasons (Bearing failure, Improper alignment of machine centre, Missing of vibration pads etc)

Trouble shooting exercises should be properly recorded in a separate format as mentioned below:

| S. No | Date of recording activity | Equipment Name | Type of Trouble | Remedial Activity | Remarks |
|-------|----------------------------|---------------------------|-----------------|--------------------|---------|
| 1 | | TMS320C6713 Processor kit | Led not glowing | Changing that LED. | |

16. ASSESSMENT AND ACCREDITATION PROCEDURE AS PER NABL

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories)

The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

16. Preparation of methodology in each experiment
17. Preparation of Standard Operating procedure for each equipment
18. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team (CLT) headed by Principal/HOD/Dean/incharge
19. Ensure Effective environmental conditions (temperature, humidity, storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.
20. Ensure Calibration of instruments/equipment (Only NABL accredited authorized laboratories provide calibration.
21. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
22. Ensure proper implementation of all the documents, formats to be included in the lab manual.
23. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.
24. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
25. Auditors should submit the detailed report of each lab duly signed to the Principal.
26. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
27. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.

28. All the safety precautions are properly displayed in front of each lab.
29. All the Lead experiments should be maintained separately in a record /record in a separate folder.
30. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal.

SUBJECTWISE LAB PLANNER**NAME OF THE SUBJECT: MICROPROCESSORS AND MICRO
CONTROLLERS LAB****CONTENTS:**

- 1. OBJECTIVES AND RELEVANCE**
- 2. SCOPE**
- 3. PREREQUISITES**
- 4. SYLLABUS AS PER JNTUH**
- 5. LEAD EXPERIMENT**
- 6. VIRTUAL LAB EXPERIMENT**
- 7. SUGGESTED BOOKS**
- 8. WEBSITES (USEFUL LINKS)**
- 9. EXPERT DETAILS**
- 10. (A) LAB SCHEDULE**
(B) VIVA SCHEDULE
(C) SCHEME OF EVALUATION
- 11. PROJECT/PRODUCT/PAPER BASED LEARNING**
- 12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D
PROPOSALS**
- 13. GUIDELINES FOR SHADOW ENGINEERING (VIP) AND
INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL
LEARNING PROGRAM)**
- 14. ACTIVITIES IN LIFT PROGRAM**
- 15. MAINTAINANCE AND TROUBLESHOOTING**
- 16. ASSESSMENT AND ACCREDITATION PROCEDURE AS PER
NABL**

1.OBJECTIVE AND RELEVANCE:

The main objective of this lab is to gain the practical hands on experience on assembly language programming. And also understanding of interfacing of various devices with microprocessor & microcontroller.

2.SCOPE:

Understanding of Microprocessors & Microcontrollers Lab has the scope that the students will be equipped with the basic knowledge of microprocessor and microcontroller interfacing and their applications. Also make the learner comfortable to work in the area of Embedded Systems.

3.PREREQUISITES:

Knowledge of electronic Digital electronics, Computer organization is required. Also basic knowledge on programming languages is required.

4.SYLLABUS AS PER JNTUH

1. Programs for 16 bit arithmetic operations for 8086 (using Various Addressing Modes).
2. Program for sorting an array for 8086.
3. Program for searching for a number or character in a string for 8086.
4. Program for string manipulations for 8086.
5. Program for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessors using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/ Counter in 8051.

12. Program and verify Interrupt handling in 8051
13. UART Operation in 8051.
14. Communication between 8051 kit and PC.
15. Interfacing LCD to 8051.
16. Interfacing Matrix/ Keyboard to 805 1.
17. Data Transfer from Peripheral to Memory through DMA controller 8237/8257.

Program:1 16 bit arithmetic operations for 8086

OBJECTIVE: To write an assembly language program for 16 bit arithmetic operations for 8086

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8086, addressing modes, assembler directives

PROCEDURE

2. Take two 16 bit numbers into two registers.
3. Perform the arithmetic operations between the two numbers
4. Store the resultant into the specified destination

APPLICATIONS

Used in microprocessor based systems to perform arithmetic applications. Microprocessor-based systems can be applied, including industrial, commercial and domestic applications

Program: 2 Program for sorting an array for 8086

OBJECTIVE: To write an assembly language program for sorting (ascending & descending) of an array

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8086, addressing modes, assembler directives, bubble sorting method

PROCEDURE:

1. Take the array of given data
2. Using comparison method find out the first maxima or first minima

3. Repeat this operation count-1 times(count = no. of bytes or words in a given array), we will get ascending or descending order

APPLICATIONS

Used in microprocessor based systems to sort data in data processing applications. Microprocessor-based systems can be applied, including industrial, commercial and domestic applications

Program: 3 searching for a number or character in a string for 8086

OBJECTIVE: To write a program for searching for a number or character in a string.

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8086, addressing modes, assembler directives

PROCEDURE:

1. Required number or character load into AL or AX register
2. Using the SCAN instruction search is performed
3. If the required number or character is present in a string the ZERO flag is set to 1 other wise resets

APPLICATIONS

Used in microprocessor based systems to find required data. Microprocessor-based systems can be applied including industrial, commercial and domestic applications

Program: 4 String manipulations for 8086

OBJECTIVE: To write a program for perform the string manipulations like transfer a string from one location to other location, string comparison, string reversal

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8086, addressing modes, assembler directives

PROCEDURE:

1. Load the given string into the source location. i.e into data segment
2. Using the string instructions like MOVSB, CMPSB perform the string operations

HINT: For string operations source is data segment, destination is extra segment

APPLICATIONS:

Used in microprocessor based systems for transferring block data , comparing the strings etc.. Microprocessor-based systems can be applied including industrial, commercial and domestic applications

Program: 6 Interfacing ADC and DAC to 8086

OBJECTIVE: To write a program for interfacing of ADC and DAC to 8086

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8086, addressing modes, assembler directives, PPI 8255

PROCEDURE:

1. Write the assembly language program for given requirement
2. Provide the interface connection between 8086 and ADC/DAC using 8255
3. Dumping the program into the kit
4. Take the output

APPLICATIONS

Used in signal processing

Program:7 parallel communication between two microprocessors using 8255

OBJECTIVE: To write a program for Parallel communication between two microprocessors using 8255

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8086, addressing modes, assembler directives, PPI 8255

DESCRIPTOION:

IEEE-488 bus provides the Parallel communication between two microprocessors using 8255

APPLICATIONS

Used in data transfer between the two systems

Program: 8 Serial communications between two microprocessor kits using 8251

OBJECTIVE: To write a program for Serial communication between two microprocessor kits using 8251

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8086, addressing modes, assembler directives, 8251

DESCRIPTOION:

RS-232 provides the serial communication between two microprocessors using 8251

APPLICATIONS

Used in data transfer between the two systems

Program: 9 Interfacing to 8086 and programming to control stepper motor.

OBJECTIVE: To write a program for Interfacing to 8086 and programming to control stepper motor.

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8086, addressing modes, assembler directives

PROCEDURE:

1. Write a program for stepper motor control
2. Provide the interface connections between the 8086 and stepper motor using 8255
3. Dump the program into kit

APPLICATIONS

Used in design of microprocessor based systems for accurate position control. Also used in robot design

Program: 10 Programming using arithmetic, logical and bit manipulation instructions of 8051

OBJECTIVE: To write a program for arithmetic, logical and bit manipulations in 8051

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8051, addressing modes

PROCEDURE:

1. Take data into two registers
2. Write the program for arithmetic, logical, bit manipulations using 8051 instructions
3. Store the resultants into destination

APPLICATIONS

Used in design of microcontroller based systems.

Program: 11 Program and verify Timer/ Counter in 8051

OBJECTIVE: To write a program for verify Timer/ Counter operation in 8051

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8051, addressing modes, register formats of TCON, TMOD

PROCEDURE:

Write the program for verify the operations of timer/counter by taking the help of TCON, TMOD register formats

APPLICATIONS

Used in design of microcontroller based systems for counting the number of clocks.

Program: 12 Program and verify Interrupt handling in 8051

OBJECTIVE: To write a program for verify Interrupt handling in 8051

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8051, addressing modes, register format of IE,IP

PROCEDURE:

Write the program for verify the Interrupt handling by taking the help of IE, IP register formats

APPLICATIONS

Used in design of microcontroller based systems for UARTs , disk I/O, power-off signals and control motors

Program: 13 UART Operation in 8051

OBJECTIVE: To write a program for UART Operation in 8051

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8051, addressing modes, register format of SCON

PROCEDURE:

Write the program for UART Operation in 8051by taking the help of SCON register format

Used in design of microcontroller based systems for data transfer operations

Program: 14 Communication between 8051 kit and PC.

OBJECTIVE: To write a program for provide the Communication between 8051 kit and PC

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8051, addressing modes, IO ports

PROCEDURE:

1. Write the program for communication between 8051 and PC
2. Provide the connection between 8051 & PC
3. Dump the program

APPLICATIONS

Used for data transfer operations.

Program: 15 Interfacing LCD to 8051.

OBJECTIVE: To write a program for Interfacing LCD to 8051

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8051, addressing modes, IO ports

PROCEDURE:

1. Write the program for LCD Interfacing
2. Provide the interface connections between 8051 and LCD
3. Dump the program into kit

APPLICATIONS

Used in design of microcontroller based systems for display purpose

Program: 16 Interfacing Matrix/ Keyboard to 8051

OBJECTIVE: To write a program for Interfacing of Keyboard to 8051

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8051, addressing modes, IO ports

PROCEDURE:

1. Write the program for keyboard Interfacing
2. Provide the interface connections between 8051 and keyboard
3. Dump the program into kit

APPLICATIONS

Used in design of microcontroller based systems for giving any input

Program: 17 Data Transfer from Peripheral to Memory through DMA controller 8237/8257.

OBJECTIVE: To write a program for Data Transfer from Peripheral to Memory through DMA controller 8237/8257.

PREREQUISITES

Knowledge on digital electronics, memory segmentation, and instruction set of 8086, addressing modes, 8257

PROCEDURE:

1. Write the program to transfer data from peripheral to memory using DMA
2. Provide the interface connections between 8086 and DMA
3. Dump the program into kit

APPLICATIONS

Used in design of microprocessor based systems to transfer bulk data between the memory to/from IO

4. LEAD PROGRAM***1.Count number of Keypress***

connect key with P3.2. Using interrupt count no of key press and display it on common anode seven segment display connected to P0.

```
#include<reg51.h>
```

```
unsigned int c=0,x=0; //initialize key counter and key flag
```

```
void extint0(void) interrupt 0
```

```
{
    x=1;           // set key flag
    c++;          // increment key count
    if(c==9)      // if its 9
    {
        c=0;      // reset it to 0 and
```

```
        P0=0xC0;    // display 0
    }
}
void main(void)
{
    IE=0x81;    // enable ext int 0
    P0=0xC0;    // display 0
loop:while(!x); // check key flag
    switch(c)    // if it is set get the count
    {
        case 1:
            P0=0xF9; // display digit from 1 to 9
            break;
        case 2:
            P0=0xA4;
            break;
        case 3:
            P0=0xB0;
            break;
        case 4:
            P0=0x99;
            break;
        case 5:
            P0=0x92;
            break;
        case 6:
            P0=0x82;
            break;
        case 7:
            P0=0xF8;
            break;
        case 8:
            P0=0x80;
            break;
        case 9:
            P0=0x90;
            break;
    }
```

```

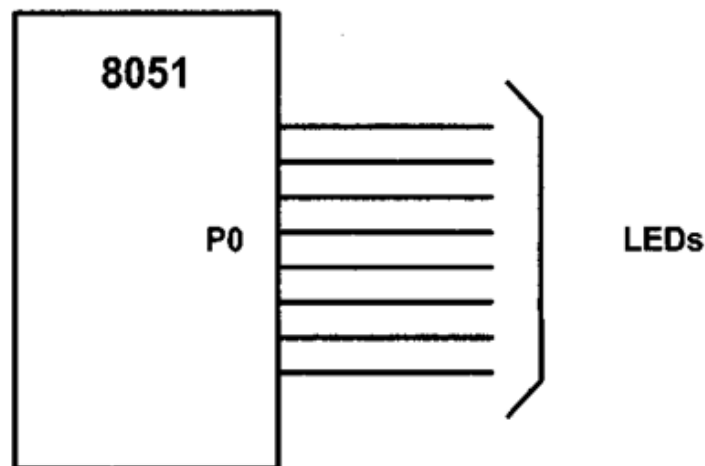
#include <reg51.h>
void T0Delay(void);
void main(void)
{
    while(1)          //repeat forever
    {
        P1=0x55;      //toggle all bits of P1
        T0Delay();    //delay size unknown
        P1=0xAA;      //toggle all bits of P1
        T0Delay();
    }
}

void T0Delay()
{
    TMOD=0x01;        //Timer 0, Mode 1
    TL0=0x00;         //load TL0
    TH0=0x35;         //load TH0
    TR0=1;            //turn on T0
    while(TF0==0);    //wait for TF0 to roll over
    TR0=0;            //turn off T0
    TF0=0;            //clear TF0
}

```

$$FFFFH - 3500H = CAFFH = 51967 + 1 = 51968$$

$51968 \times 1.085 \mu s = 56.384 \text{ ms}$ is the approximate delay.



6. VIRTUAL LAB EXPERIMENT:

}
 x=0;
 //
 clear
 key
 flag

 goto
 loop;
 //
 loop
 conti
 nue
 }
 2.Bli
 nking
 LED
 Using
 8051
 Micro
 contr
 oller
 with
 Embe
 dded
 C

**PRO
 GRA
 M:**

1. Write a C program that continuously gets a single bit of data from PI. 7 and sends it to PI.O, while simultaneously creating a square wave of 200 (as period on pin P2.5. Use timer 0 to create the square wave. Assume that XTAL = 11.0592 MHz.

Solution:

We will use timer 0 in mode 2 (auto-reload). One half of the period is 100 μ s.
 $100 / 1.085 \mu\text{s} = 92$, and TH0 = 256 - 92 = 164 or A4H

```
#include <reg51.h>

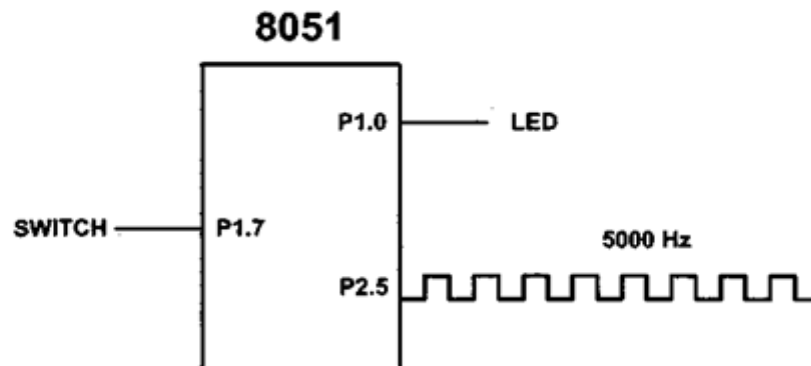
sbit SW      = P1^7;
sbit IND     = P1^0;
sbit WAVE    = P2^5;

void timer0(void) interrupt 1
{
    WAVE = -WAVE;    //toggle pin
}

void main()
{
    SW = 1;          //make switch input
    TMOD = 0x02;
    TH0 = 0xA4;     //TH0 = -92
    IE = 0x82;     //enable interrupts for timer 0
    while(1)
    {
        IND = SW;  //send switch to LED
    }
}
```

$$200 \mu\text{s} / 2 = 100 \mu\text{s}$$

$$100 \mu\text{s} / 1.085 \mu\text{s} = 92$$



1. Verify the timer /counter using embedded C

Write a 8051 C program to toggle all the bits of port P1 continuously with some delay in between. Use Timer 0, 16-bit mode to generate the delay.

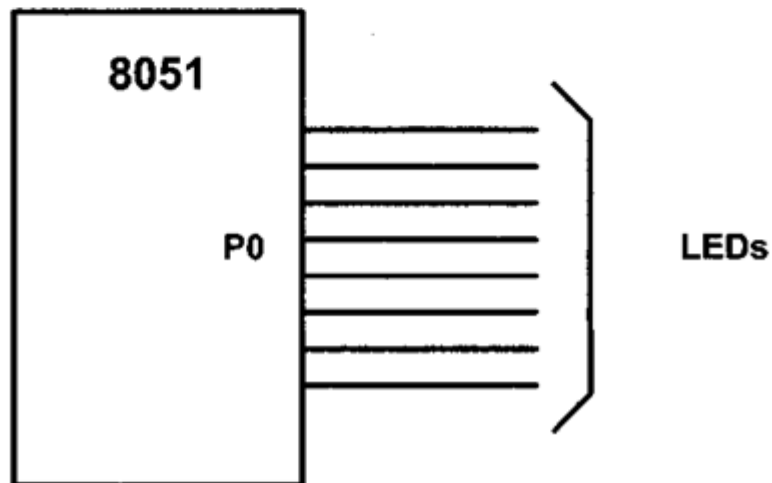
Solution:

```
#include <reg51.h>
void T0Delay(void);
void main(void)
{
    while(1)          //repeat forever
    {
        P1=0x55;      //toggle all bits of P1
        T0Delay();    //delay size unknown
        P1=0xAA;      //toggle all bits of P1
        T0Delay();
    }
}

void T0Delay()
{
    TMOD=0x01;        //Timer 0, Mode 1
    TL0=0x00;         //load TL0
    TH0=0x35;         //load TH0
    TR0=1;            //turn on T0
    while(TF0==0);    //wait for TF0 to roll over
    TR0=0;            //turn off T0
    TF0=0;            //clear TF0
}
```

$FFFFH - 3500H = CAFFH = 51967 + 1 = 51968$

$51968 \times 1.085 \mu s = 56.384 \text{ ms}$ is the approximate delay.

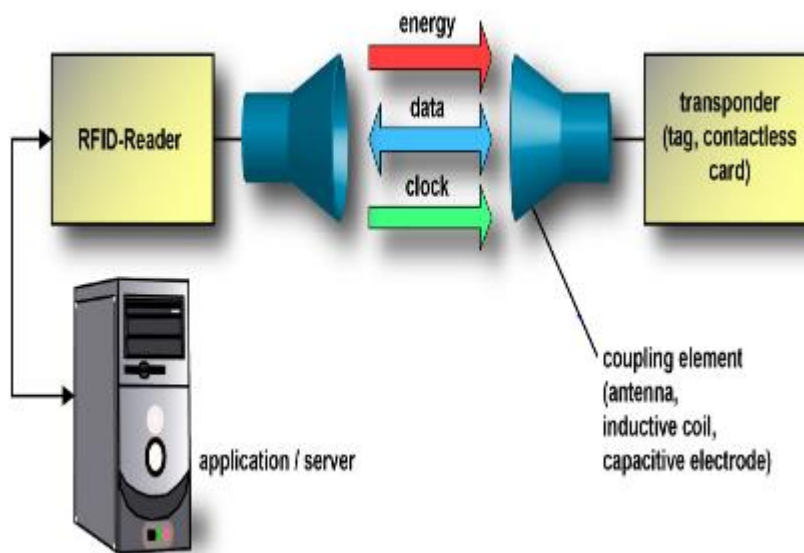


RFID Interfacing with 8051 Microcontroller

RFID -A Technology Better Than Barcodes

RFID is an acronym for Radio Frequency Identification. It is a method for Data capture and Automatic Identification. RFID uses electromagnetic fields to transfer the data, for automatically identifying and tracking tags attached to the objects. RFID technology is similar to the bar code technology, but the major difference is that it uses radio waves to retrieve the data instead of using the optical scanning process for barcodes on a label.

RFID System Components



RFID system consists of mainly five components. They are:

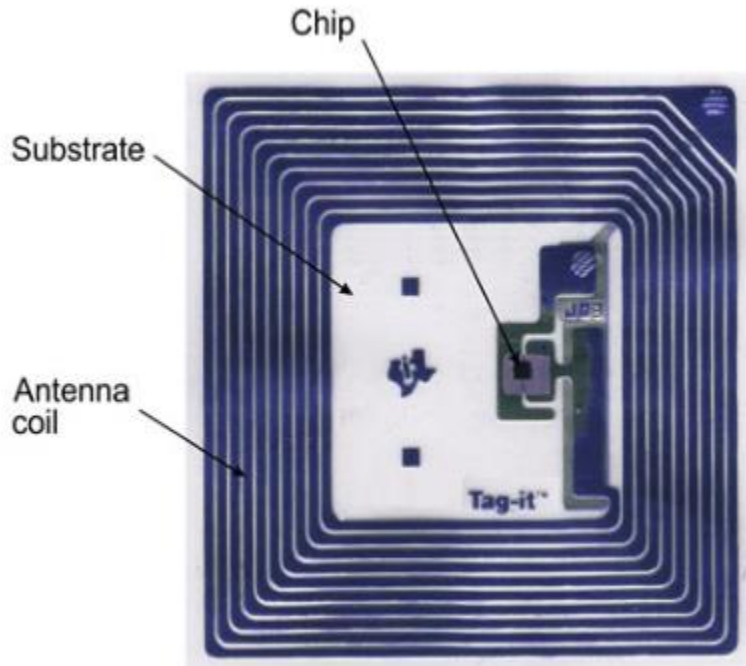
- RFID Tag,
- Antenna
- RFID Reader
- Application Software
- Communication Infrastructure

How RFID Works?

When the power supply is given to the RFID reader, first it will start to emit radio waves continuously. Now, when the RFID tag is brought within the range of the reader, the tag will start to send radio waves back to the reader. The reader then receives the waves and identifies the frequency to generate a unique ID. Reader after decoding the data encoded in the integrated circuit of tags transmits it to the PC for use.

RFID tag is a small device which stores and sends data to RFID reader.

1. RFID Tag Elements



Generally, RFID tag consists of an integrated circuit, antenna, non-volatile memory and a programmable data processor as its major components.

- Integrated circuit: is used for the process and store of information like identification number, demodulate and modulating of RF signal and collecting DC power from the reader signal.
- Antenna: is basically used for transmitting and receiving the reader signal.
- Non- volatile memory: tag information is been stored safely in a non- volatile memory.
- Programmable data processor: is used for processing the sensed and transmitted data.
- RFID tag also consists of a protective material which helps to hold the components together and shield them from environment conditions.

2. RFID Tag Types

| <u>Frequency Classification</u> | <u>Frequency Band (Hz)</u> | <u>Reading Range</u> |
|---------------------------------|----------------------------|----------------------|
| Low Frequency | 125 kHz | 0.3 meters |
| High Frequency | 13.56 MHz | 1 meter |
| Ultra High Frequency (UHF) | 433 MHz to 2.45 GHz | 1-3 meters |
| Microwave Frequency | 2.45 GHz to 300 GHz | 2+ meters |

- **Passive RFID Tags:** These types of tags do not contain the power. They usually receive the power from the reader. Passive RFID tags are known popularly by the names RFID smart tags or RFID smart labels. These tags have a read range of up to 2 meters. Cost around 25 cents to few dollars.
- **Semi-Passive Tags:** It uses a battery to perform the operation. Also it utilizes the power from the RFID reader in order to transmit the signal to the reader from the tag.
- **Active Tags:** These types of tags only use the battery power to do the entire operation. They have a large reading range. Cost around 50 to 250 dollars

Table 1 shows four frequency bands used in the RFID tags. The most commonly used are low frequency because they are easily readable. Higher frequencies have greater read ranges and are less sensitive to noise than the low frequency tags. RFID tags with microwave frequency do have great read ranges and higher read speeds than low frequency tags, but they require more power.

7. SUGGESTED BOOKS:

TEXT BOOKS:

1. D. V. Hall. Micro processors and Interfacing, TMGH. 2nd edition 2006.
2. Kenneth. J. Ayala. The 8051 microcontroller, 3rd edition, Cengage learning, 2010

REFERENCE BOOKS:

1. Advanced Microprocessors and Peripherals - A. K. Ray and K.M. Bhurchandani, TMH, 2nd edition 2006.
2. The 8051 Microcontrollers, Architecture and programming and Applications -K.Uma Rao, Andhe Pallavi,,Pearson, 2009.
3. Micro Computer System 8086/8088 Family Architecture. Programming and Design - By Liu and GA Gibson, PHI, 2nd Ed.,
4. Microcontrollers and application, Ajay. V. Deshmukh, TMGH. 2005

8. WEB SITES (USEFUL LINKS):

1. http://www.ing.unlp.edu.ar/electrotecnia/arcom1/UNDERSTANDING8085_8086_cap14_Instrucion_set.pdf- *instuction set of 8086*
2. <https://www.youtube.com/watch?v=iV4TPnOLvgA>- *instuction set of 8086*
3. http://www.electronics.dit.ie/staff/tscarff/8086_address_modes/8086_address_modes.htm- *addressing modes*
4. <https://www.youtube.com/watch?v=Po6Wyb1ltIk>- *addressing modes*
5. <https://www.youtube.com/watch?v=0-ljoBEi-WE>- *interfacing of 8086*
6. http://nptel.ac.in/courses/Webcourse-contents/IITKANPUR/microcontrollers/micro/ui/Course_home4_29.htm - *Architecture of 8086*
7. <https://www.youtube.com/watch?v=liRPtvj7bFU>- *Introduction to Microprocessors & Microcontrollers .*
8. <http://www.slideshare.net/farohalolya/8086-microprocessor-lab-manual>
9. <https://www.youtube.com/watch?v=MCJUDbo-YIg>- *Ascending order program*
10. nec.edu.np/faculty/chandrat/8086imp.pdf- *some programs*
11. www.srmuniv.ac.in/downloads/microprocessor.pdf- *manual SRM Univerisity*
12. www.bvrit.ac.in/b-category-details/doc_download/242-mpmciveee- *lab manual BVRIT*

9.EXPERT DETAILS**International :**

1. Douglas V. Hall- State University of New York at Albany

National:

1. A K Ray Ph.D.(IIT Kharagpur) Professor, Electronics & Electrical Communication Engineering.
2. Prof. Veena N Hegde, BMSCE, B'lore
3. Prof. Roopa R Kulkarni, GIT, Belgaum
4. Dr. N.K. Srinath - R V College of Engineering

10. (A) LAB SCHEDULE: (GROUP-I)**NOTE: 3 students per batch or 1 system per student****CYCLE-I**

| BATCH ES | WEEK 1 | WEEK 2 | WEEK 3 | WEEK 4 | WEEK 5 | WEEK 6 | WEEK 7 | WEEK 8 |
|----------|--------|--------|--------|--------|--------|--------|--------|---------------|
| B1 | DEMO | EXP1 | EXP2 | EXP3 | EXP4 | EXP5 | EXP6 | REVISION/TEST |
| B2 | DEMO | EXP1 | EXP2 | EXP3 | EXP4 | EXP5 | EXP6 | REVISION/TEST |
| B3 | DEMO | EXP1 | EXP2 | EXP3 | EXP4 | EXP5 | EXP6 | REVISION/TEST |
| B4 | DEMO | EXP1 | EXP2 | EXP3 | EXP4 | EXP5 | EXP6 | REVISION/TEST |
| B5 | DEMO | EXP1 | EXP2 | EXP3 | EXP4 | EXP5 | EXP6 | REVISION/TEST |
| B6 | DEMO | EXP1 | EXP2 | EXP3 | EXP4 | EXP5 | EXP6 | REVISION/TEST |
| B7 | DEMO | EXP1 | EXP2 | EXP3 | EXP4 | EXP5 | EXP6 | REVISION/TEST |
| B8 | DEMO | EXP1 | EXP2 | EXP3 | EXP4 | EXP5 | EXP6 | REVISION/TEST |
| B9 | DEMO | EXP1 | EXP2 | EXP3 | EXP4 | EXP5 | EXP6 | REVISION/TEST |
| B10 | DEMO | EXP1 | EXP2 | EXP3 | EXP4 | EXP5 | EXP6 | REVISION/TEST |

CYCLE-II

| BATCH ES | WEEK 9 | WEEK 10 | WEEK 11 | WEEK 12 | WEEK 13 | WEEK 14 | WEEK 15 | WEEK 16 |
|----------|--------|---------|---------|---------|---------|---------|----------|---------|
| B1 | EXP7 | EXP8 | EXP9 | EXP10 | EXP11 | EXP12 | REVISION | TEST |
| B2 | EXP7 | EXP8 | EXP9 | EXP10 | EXP11 | EXP12 | REVISION | TEST |
| B3 | EXP7 | EXP8 | EXP9 | EXP10 | EXP11 | EXP12 | REVISION | TEST |
| B4 | EXP7 | EXP8 | EXP9 | EXP10 | EXP11 | EXP12 | REVISION | TEST |
| B5 | EXP7 | EXP8 | EXP9 | EXP10 | EXP11 | EXP12 | REVISION | TEST |
| B6 | EXP7 | EXP8 | EXP9 | EXP10 | EXP11 | EXP12 | REVISION | TEST |

| | | | | | | | | |
|-----|------|------|------|-------|-------|-------|----------|------|
| B7 | EXP7 | EXP8 | EXP9 | EXP10 | EXP11 | EXP12 | REVISION | TEST |
| B8 | EXP7 | EXP8 | EXP9 | EXP10 | EXP11 | EXP12 | REVISION | TEST |
| B9 | EXP7 | EXP8 | EXP9 | EXP10 | EXP11 | EXP12 | REVISION | TEST |
| B10 | EXP7 | EXP8 | EXP9 | EXP10 | EXP11 | EXP12 | REVISION | TEST |

B) VIVA SCHEDULE: The viva schedule should be planned prior starting to the lab experiment.

ROUND - 1

| Roll numbers | week-2 | week-3 | week-4 | week-5 | week-6 | week-7 |
|--------------|--------|--------|--------|--------|--------|--------|
| 1-10 | viva | | | | | |
| 10-20 | | viva | | | | |
| 20-30 | | | viva | | | |
| 30-40 | | | | viva | | |
| 40-50 | | | | | viva | |
| 50-60 | | | | | | viva |

ROUND - 2

| Batches | WEEK 9 | WEEK 10 | WEEK 11 | WEEK 12 | WEEK 13 | WEEK 14 |
|---------|--------|---------|---------|---------|---------|---------|
| SG1 | viva | | | | | |
| SG2 | | viva | | | | |
| SG3 | | | viva | | | |
| SG4 | | | | viva | | |
| SG5 | | | | | viva | |
| SG6 | | | | | | viva |

*SG: Selected Group with a maximum of 12 students

C) Scheme of Evaluation:

Internal (10m)

- i) Write the program(4m)
- ii) Execute the program(4m)

iii)Viva-voce(2m)

External (50m)

i)Write the program(20m)

ii)Execute the program(20m)

iii)Viva-voce(10m)

6. PROJECT/PRODUCT/PAPER BASED LEARNING

Vehicle Tracking and Monitoring by computing geo-location information System on Raspberry Pi and Android Mobile

Abstract:

In this fast life, everyone is in hurry to reach their destinations. In this case waiting for the buses is not reliable. People who rely on the public transport their major concern is to know the real time location of the bus for which they are waiting for and the time it will take to reach their bus stop. This information helps people in making better travelling decisions. This paper gives the major challenges in the public transport system and discusses various approaches to intelligently manage it. The proposed system would make good use of new technology that based on Embedded Linux board namely Raspberry Pi and Smartphone android application. The proposed system works on GPS/GPRS/GSM SIM900A Module which includes all the three things namely GPS GPRS GSM. The GPS current location of the vehicle; GPRS sends the tracking information to the server and the GSM is used for sending alert message to vehicle's owner mobile. The proposed system would place inside the vehicle whose position is to be determined on the web page and monitored at real time. In the proposed system, there is comparison between the current vehicle path and already specified path into the file system of raspberry pi. If the vehicle's speed goes beyond the specified value of the speed, then also the warning message will be sent from system to the owner mobile. The proposed system also took care of the traveler's safety by using LPG Gas leakage sensor MQ6 and temperature sensor DS18B20.

I.INTRODUCTION

In final decade, we become aware of the drivers fatigue using and vehicle theft activity which causes social real time difficulty like accidents and many more hazards stipulations. We everyday see or read such type of movements that are elevating the query of our security and safety in both public and confidential sectors. So there is need of real time monitoring and tracking the automobile also storing and updating its database of designated occasions. In the city areas, human help is relatively problematic in providing the database of tracked vehicle. In the proposed procedure, the system supplies a wholly automatic tracking and monitoring of the vehicle which useful for school bus, their homeowners, children's defence and likewise it provides the correct arrival time of the vehicle at unique vicinity or discontinue. And accordingly making use of accuracy in time, kids can spend extra time in learning, napping, or relaxing instead than wait for a delayed bus. Spending less time waiting for a bus improves comfy and strong time administration of the pupil as well [4]. So as to shrink man energy and saving of cash, right here the approach presents handy monitoring solution utilizing Embedded Linux Board. The proposed procedure get tracking understanding of the vehicle like car number (targeted identification), vicinity, velocity, Date, Time and retailer into the database of Raspberry pi. The procedure additionally provides students security mechanism with the aid of temperature sensor and gas leakage sensor. Hence within the case of raising the temperature inside the vehicle as a result of some purpose or leakage of the LPG fuel within the vehicle, the alert message get send to the driver as good as vehicle owner. For tracking the vehicle using GPS and maintain its database, MySQL database system is use which advanced feature of Raspberry-Pi. In the database base monitoring and updating mechanism, the GSM/GPRS module is used which transmit the updated vehicle database to the server and user access the database using web page in Smartphone. That shows the real time vehicle location in the Smartphone [3]. Thus, users will be able to continuously monitor a moving vehicle on demand using the Smartphone and determine the estimated distance and time for the vehicle to arrive at a given destination.

II. IDENTIFIED GAPS

Vehicle tracking has become so advanced and simple with various upcoming technologies. But the cost effectiveness and its implementation have become high. The problem lies in maintaining high grade servers to backup the data for vehicle tracking and the use of internet to track these vehicles. Although real time tracking of vehicles through internet gives an fails to provide less cost of investment and maintenance. The system uses an internal database to look up the location of the vehicle with the GPS co ordinates received. So it doesn't use the GPRS and TCP/IP protocol for internet for data transfer between servers and the user device. Hence this reduces the cost of the tracking system. Also the location details are sent quickly through SMS via the GSM modem.

III. RESEARCH DESIGN AND METHODOLOGY

The proposed approach would get controlled with the support of Raspberry pi which placed throughout the vehicle. The GPS/GPRS/GSM SIM900A module get keep up a correspondence with raspberry pi utilizing USB interface. The longitudes and latitudes of the current path obtained from GPS get compared with the stored longitudes and latitudes in the specific file layout inside the database of raspberry pi. If that longitudes and latitudes no longer fit with the save done then mistaken path detection alert message will get dispatched to vehicle's owner mobile. Also the longitudes and latitudes of the present route obtained from GPS will get dispatched to the server with the support of GPRS which helps to monitor the vehicle's present location on the net page utilizing Smartphone. Right here for monitoring the vehicle, the proposed approach provides login facility on net web page for automobile's owner, student and their parents. Also proposed system provides student's safeguard with the support of DS18B20 temperature sensor and gas leakage sensor MQ6. These sensors get interface with raspberry pi. If the temperature within the vehicle crosses the targeted value or LPG gas get leakage within the vehicle then the alert message will sent to the vehicle's owner. Likewise protection mechanism provided by method.

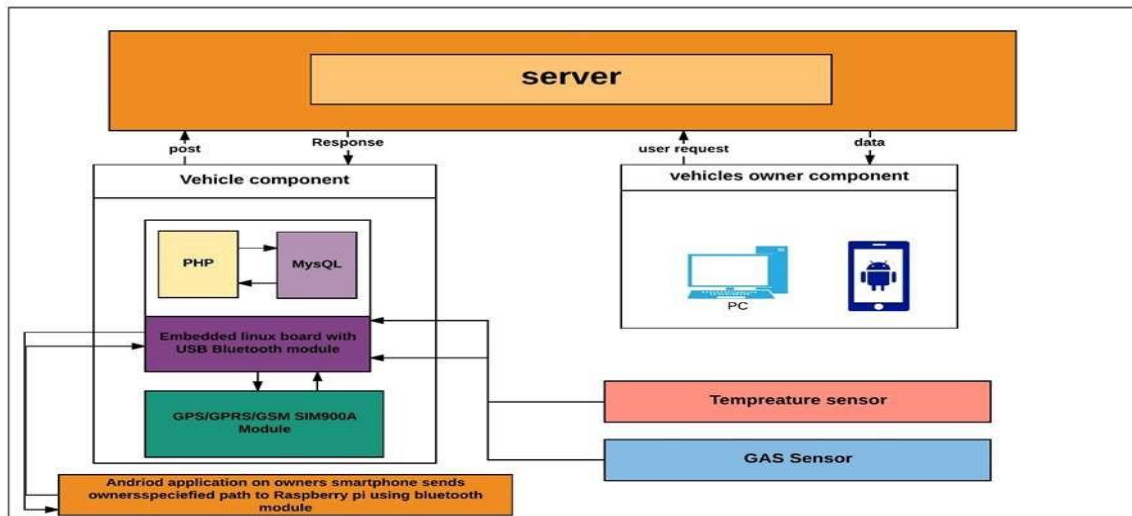


Fig.1. Proposed system block diagram

1. Real time vehicle tracking on the web page using GPS/GPRS/GSM SIM900A module and Raspberry pi: SIM900A Module which gets interfaces with the Raspberry Pi gives the real time tracking information of the vehicle such as longitude, latitude, speed, time of the vehicle. That information taken from USB interface get stored into the database and further sends to the server. The system gives tracking provision on web page for registered user only as follows:

- A) **Super Login:** In this provision, the vehicle's owner can track the vehicle in his Smartphone using Super Login on the web page. Hence only owner can access this login.
- B) **Primary Login:** In this provision, the registered student scan tracks the school vehicle in their Smartphone using Primary Login on web page. Hence only those students who get registered into the system can access this login.
- C) **Secondary Login:** In this provision, the student's parents can track the school vehicle in their Smartphone using Secondary Login on the web page. Hence only registered student's parents can access this login.

2. Vehicle's right and wrong path tracking algorithm using Smartphone:

The proposed method presents extra security and comfortable resolution making use of android application for faulty path alert. The vehicle owner's Smartphone having an android application that supplies the expertise involving selection of particular path from A to B through which the vehicle alleged to journey. And therefore driver drives the vehicle on the

trail that decided through android utility of owner's Smartphone best. At first vehicle's owner trace the decided direction A to B on android application that offers longitude and latitude of that special path. Then android software saves that longitudes and latitudes of traced course in a designated file layout such that owner can send that file to the raspberry pi database making use of Bluetooth or USB port. And consequently the proposed system can method additional on that data.

3. Vehicle tracking information database monitoring system using LAMP (Linux, Apache, MySQL, and PHP):

The vehicle tracking system works upon an algorithm in which, real time information of vehicle such as Longitudes, Latitudes, Speed, Date, and Time get store into the database of Raspberry pi using Linux, Apache, MySQL, and PHPi.e. LAMP system. The GPRS of SIM900A Module will sent this vehicle information to the server, and at server side, updating and storing of this vehicle information takes place dynamically which make easier for monitoring and tracking vehicle at real time on web page using web browser on Smartphone which gives more accurate result of current location.

4. Students Safety mechanism using temperature Sensor and LPG gas detect sensor:

The proposed system takes care of the children's safety by using LPG Gas leakage sensor and temperature sensor. The temperature sensor DS18B20 which works on the 1 wire protocol gives a digital output hence can be get directly interface with the Raspberry Pi. The threshold value of the temperature set in the program. If that threshold temperature value gets cross by output value of the temperature sensor due to some reason then alert message will be sent to the vehicle owner's Smartphone. Also the LPG Gas leakage sensor get interface with Op-amp LM358N which gives a digital output. That output voltage can be controlled by using current limiting resistors which helps the Raspberry pi's GPIO from damage. [7] proposed a system which is an innovative congestion control algorithm named FAQ-MAST TCP (Fast Active Queue Management.

Stability Transmission Control Protocol) is aimed for high-speed long-latency networks. Four major difficulties in FAQ-MAST TCP are highlighted at both packet and flow levels. The architecture and characterization of equilibrium and stability properties of FAQ-MAST TCP are discussed. Experimental results are presented comparing the first Linux prototype with TCP Reno, HSTCP, and STCP in terms of throughput, fairness, stability, and responsiveness. FAQ- MAST TCP aims to rapidly stabilize high-speed long-latency networks into steady,

efficient and fair operating points, in dynamic sharing environments, and the preliminary results are produced as output of our project. The Proposed architecture is explained with the help of an existing real- time example as to explain why FAQ-MAST TCP download is chosen rather than FTP download.

IV.THE DESIGN OF TESTING ENVIRONMENT

The proposed system provides more safety and secure solution using android application for wrong path alert. The vehicle owner's Smartphone having an android application that provides Raspberry pi have been taken from android application using Bluetooth.

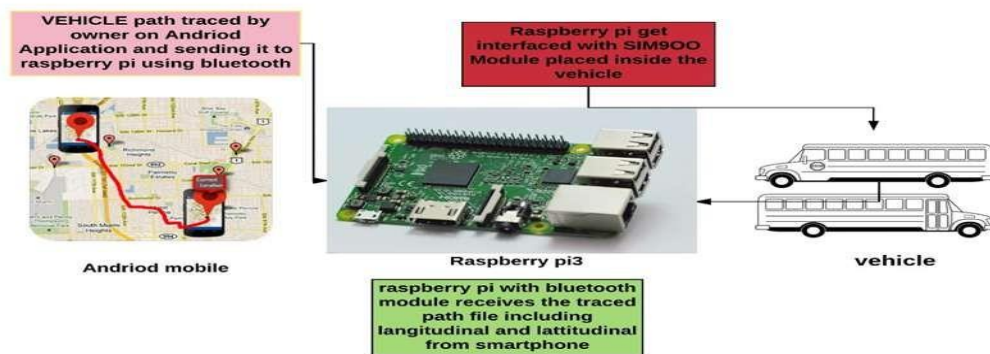


Fig.2. The longitudes and latitudes which are stored in the file format inside

The information regarding selection of particular path from A to B through which the vehicle supposed to travel. And hence driver drives the vehicle on the path that decided by android application of owner's Smartphone only.

1. Testing results of GPS module using Raspberry pi:

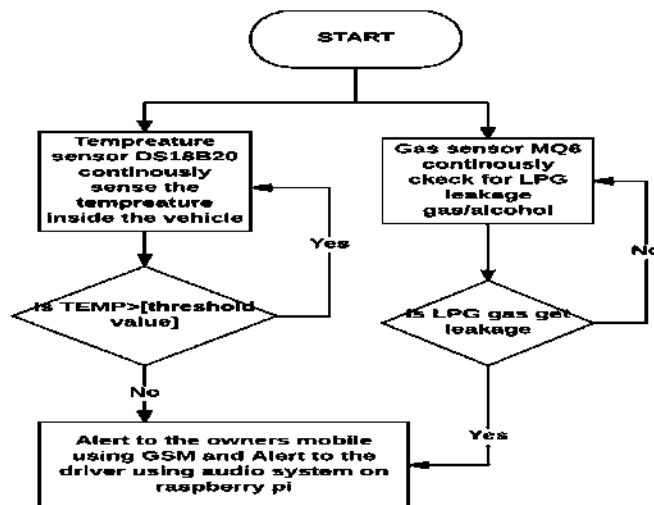
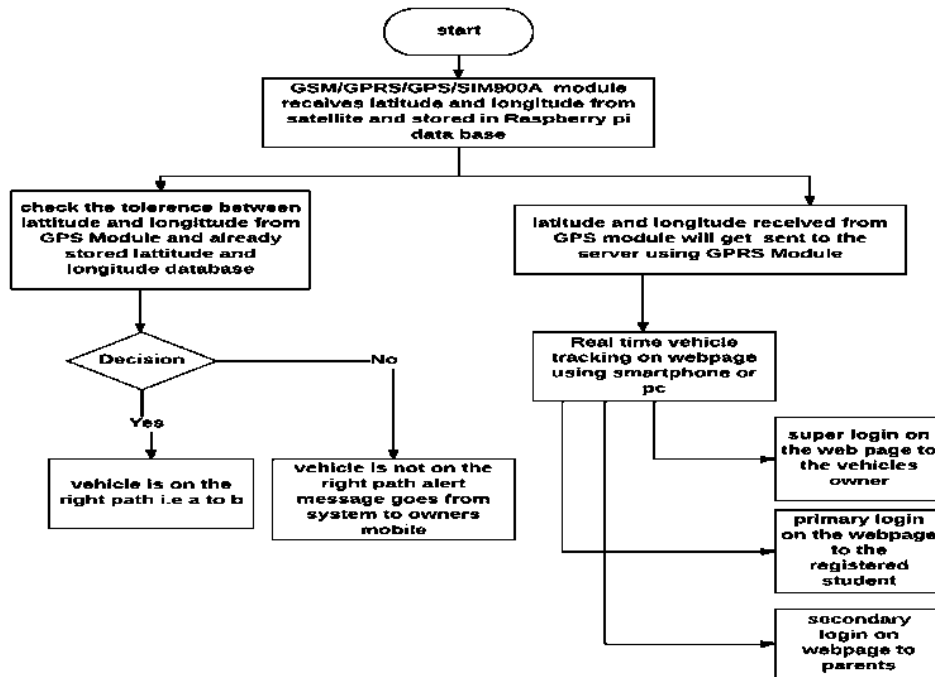
The GPS Module testing gives the following results of all output sequence GPS data.

```

pi@raspberrypi: -
$GNRMC,093203.000,A,1650.3622,N,07435.7935,E,0.00,41.66,220115,,A*41MC,092831.081,V
$GNGSA,A,3,78,66,77,67,68,,,,,,,,,
$GPVTG,41.66,T,,M,0.00,N,0.01,K,A*091,T,,M,59.27,N,109.84,K,N*39
$GNRM
$GPGGA,093204.000,1650.3622,N,07435.7935,E,1,11,1.04,566.6,M,-70.4,M,,*42
$GNGSA,A,1,,,,,,,,,,,,,*
$GPVTG,41.66,
$GNGSA,A,3,31,22,14,01,04,32,,,,,,,,,1.99,1.04,1.70*1D
$GPGGA,093115.000,1650.3627,N,07435.7927,E,1,
$GNGSA,A,3,78,66,77,67,68,,,,,,,,,1.99,1.04,1.70*1E
$GPVTG,50.18,T,,M,6
$GNRMC,093025
$GNRMC,093204.000,A,1650.3622,N,07435.7935,E,0.00,41.66,220115,,A*460,,M,,M,,*42
$GNGSA,A,3,78,66,77,67,68,,,,,,,,,
$GPVTG,41.66,T,,M,0.00,N,0.00,K,A*08

```

II.FLOW DIAGRAM OF PROPOSED SYSTEM



The proposed system for this reason made excellent use of Smartphone technology through offering safety and secure touring to the traveler making use of faulty path alert mechanism. The proposed system performs a major role in actual time monitoring and monitoring of vehicle by updating auto actual time expertise on the server part after distinctive interval of time in order to monitored vehicle continuously. Each time driver drives vehicle on the erroneous path or incase of vehicle's accident disaster occurs, the proposed system presents the vehicle's present location, speed to the vehicle owner's mobile. Therefore this benefits to monitor the vehicle as early as possible. Student's defence mechanism also gets supplied making use of temperature and LPG fuel leakage sensors.

12. MAPPING OF LAB WITH PROJECT/CONSULTANCY/R & D PROPOSALS

SPEED CHECK TO DETECT RASH DRIVING ON VEHICLES

The main objective of this work is to develop a device to detect rash driving on vehicles and to alert the system in case of any speed violation. Accidents due to rash driving on vehicles are on the rise and people are losing their lives because of others mistakes. In the present system, to detect rash driving a handheld radar gun used which aims at the vehicle to record its speed. If the speed of the vehicle exceeds the speed limit, nearest station is informed to stop the speeding vehicle. This is an ineffective process as after detecting one has to inform the same and a lot of time is wasted.

The proposed system will check on rash driving by calculating the speed of vehicle and using the phone's built-in GPS system to show your current, maximum and average speed and vehicle number. The speed limit is set and the time taken by the vehicle to travel from one set point to other is calculated by control circuit. Based on that time it then calculates the speed and displays on seven segment display and also information is sent to the using GPS through message about the speed of vehicle and vehicle number through GSM. More over if the vehicle crosses the speed limit a buzzer sounds alerting the vehicle.

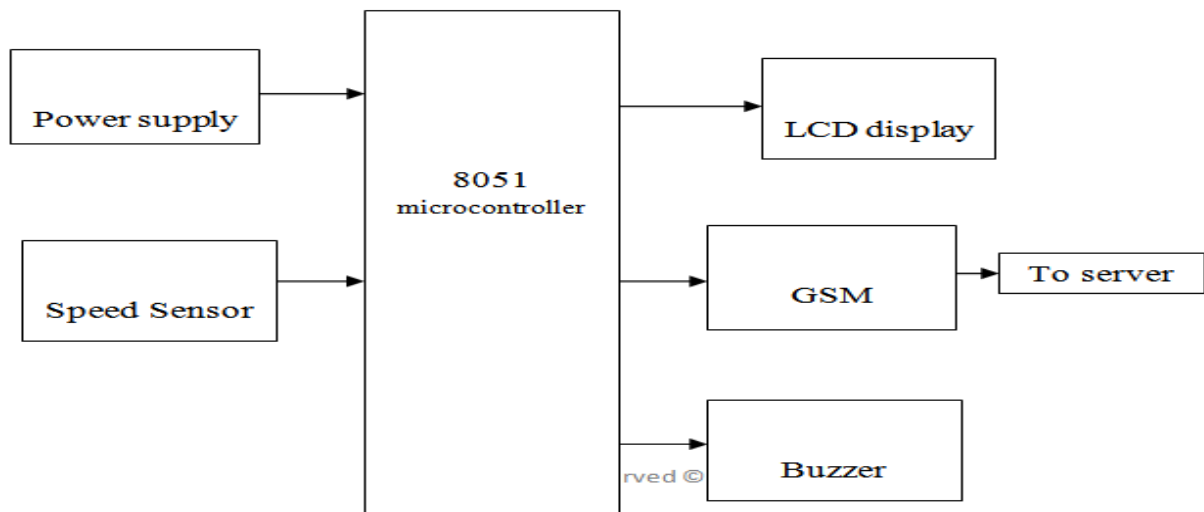


Fig 1: Block diagram of the project

Project proposal

ALPHABETICAL KEYPAD USING AT89C51 MICROCONTROLLER

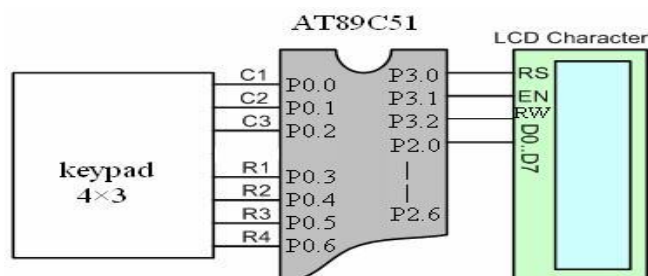
Abstract:

This paper explains about how to display the English alphabets using alpha keyboard. The first part of the paper explains about the interfacing of 89C51 with LCD and keyboard i.e which ports of 89C51 are used in interfacing with LCD and which port is used for keyboard interfacing.

The second part of the paper explains about the operation of 89C51 in displaying on the English alphabets using LCD and keyboard. 4x3 matrix keypad and a 16x2 LCD have been used here. Keypad and LCD are very commonly used input & output devices respectively. The 16x2 LCD can display only 16 characters in a line. 89C51 microcontroller used in this paper to explain about displaying of English alphabets using LCD and alpha keyboard is a 20 pin device which has four ports in it and we are using only two ports to display English alphabets, one for interfacing LCD and other port to interface keyboard. The application of displaying English alphabets using alpha keyboard is mostly seen in cell phones, security purposes, in laptops to enter the text data on the monitor.

KEY WORDS:

4X3 Matrix keypad, 16x2 lcd, 89C51 microcontroller, alpha keyboard, English alphabets.



Wireless Electronic Notice Board with Multi Point Receivers using Zig-bee Communication System in colleges or companies

ABSTRACT:

Notice boards play a vital role mostly in educational institutions. The events, occasions or any news, which has to be passed to the students, will be written on the notice boards present in every floor in the colleges or schools. The present system is like, a person will be told the news and he has to update this news on all the notice boards present in the college or school. This will be seen mostly during the examination seasons.

The time table or the schedule of the exams has to be given to the students. This will be done by writing the details on the notice boards. But this process consumes a lot time to update the news on all the notice boards and there may be chances that the person responsible may commit some mistakes or he may be absent sometimes.

So, this may create disturbances and the entire schedule may be disturbed. To avoid all these, Wireless Notice Board have been designed which completely eliminates the manual work.

This project uses the wireless communication, Zigbee. The Zigbee transmitter will be present at the Principal or the person related to the issues to be displayed on the notice board. PC keyboard is used as the input device here in this project. Whenever the user wants to send the news updated to the notice board, he types that particular message using keyboard and the same data will be transmitted through Zigbee transmitter.

At the receiving end, the Zigbee receiver and the decoder will be fixed to the display panel. The receiver receives the data coming from the transmitter and the same data will be received by the microcontroller at the receiver end. The microcontroller sends this data to the display unit and thus the message given by the user at the transmitter end will be displayed.

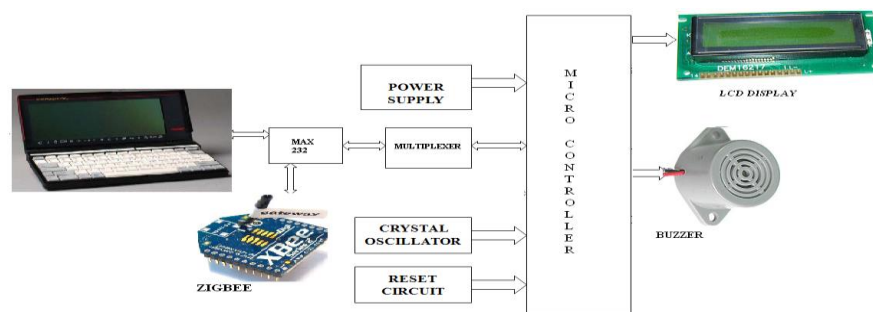
Hardware Tools:

1. Microcontroller AT89S52.
2. LCD
3. MAX232
4. ZIGBEE
5. Buzzer
6. PC
7. MULTIPLEXER

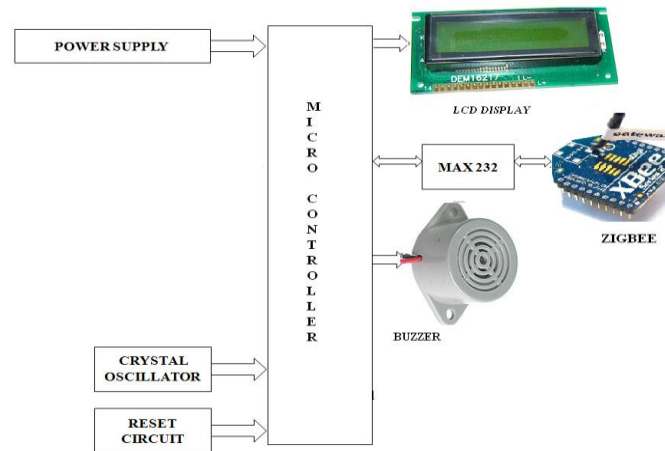
Software Tools:

1. Kiel compiler
2. Embedded C
3. Proload

Transmitter section



Receiver Section



13. GUIDELINES FOR SHADOW ENGINEERING (VIP) AND INDUSTRIAL VISITS (IIP – INNOVATIVE INDUSTRIAL LEARNING PROGRAM)

OBJECTIVES OF SHADOW ENGINEERING:

1. The program which uplifts the knowledge of the students related to laboratories.
2. To improve the industry-college interactions.
3. To create industry like environment for all the students in order to make future assignments.
4. This program leads to matrixing with the students.

TABLE 1: INDUSTRIAL VISITS

| S. No | Type of industry | Nature of industry | Date of visit | No. of students participated | Year/branch | remarks |
|-------|------------------|--------------------|---------------|------------------------------|-------------|---------|
| 1 | | | | | | |
| 2 | | | | | | |

**TABLE 2: INDUSTRIAL TRAINING (Shadow Engineering)
(Career Visit Approval)**

14. ACTIVITIES IN LIFT PROGRAMME (CALIBRATION/INSTALLATION AND TESTING):

| S. No | Name of the Course | Nature of industry | Duration of Training | Authority | Date of Training/Certificate No. | remarks |
|-------|--|--------------------|----------------------|-----------|----------------------------------|---------|
| 1 | HANDS ON EXPERIENCE IN MICROPROCESSORS | SS LAB | 2 DAYS | DIRECTOR | | |

Calibration: Aim of this concept is to check:

- i. whether all the equipment is functioning correctly as per the Standards
- ii. To bring correctness in the errors of instrument or equipment.
- iii. To rectify the errors if any

Installation: Aim of this concept is to make and maintain installation procedure for a New equipment or already existing equipment

Testing : Aim of this concept is to test the equipment after installation whether it Meets the existing standards.

The list of equipments (hardware/software):

- (i)Necessity of tools for development and testing
- (ii)Equipment to be calibrated
- (iii)Installation of supporting equipment if any.

After calibration the details of equipment should be submitted in following format.

As all the equipments in the lab are kit based, so that calibration is not done by lab in-charge.

After testing of the equipment two microprocessor kits are not working.

| S.no | Type of equipment | Certificate no | Certificate issued by | Date of calibration | Date of calibration due | Remarks |
|------|-------------------|----------------|-----------------------|---------------------|-------------------------|---------|
| 1 | | | | | | |
| 2 | | | | | | |

Procedure for Installation:

iv. Calibration, Testing and Installation details equipment wise are mentioned as Follows:

Case 1: Calibration of Equipment: CRO

Case 2: Installation of mat lab.

12. MAINTAINANCE AND TROUBLESHOOTING:

(A)Maintenance:

Maintenance and trouble shooting of equipment in a laboratory must follow the following guidelines:

Maintenance Schedules:

- (1) Preventive Maintenance Schedules of lab will be decided by lab in charge along with concerned HOD. The details of schedule should be recorded in the following template of format.

| S.No. | Date of recording activity | Equipment Name | Type of Trouble | Remedial Activity | Remarks |
|-------|----------------------------|---------------------|-----------------------------|-----------------------------------|---------|
| 1 | 05/03/2018 | Microprocessor kits | LCD display of kit blinking | Get the service from the supplier | |

(2) Maintenance Reports duly signed by in charges as well as HODs and duly approved by Principal periodically.

(B) TROUBLE SHOOTING SCHEDULES:

A proposal is to be made from each lab branch wise. The proposal should carry following details related to specific equipment in lab.

S. No., Equipment Name , Type of Problem (Too much Noise, Abnormal Sound, Corrupt Software, Anti Virus Problem, Missing of Display, CRT not working, Motor is not giving signal, Digital display is not working, Break of tools, Misalignment of machine elements, PLC is not properly working), Expected Reasons (Bearing failure, Improper alignment of machine centre, Missing of vibration pads etc)

Trouble shooting exercises should be properly recorded in a separate format as mentioned below:

| S. No | Date of recording activity | Equipment Name | Type of Trouble | Remedial Activity | Remarks |
|-------|----------------------------|----------------|-----------------|-------------------|---------|
| 1 | | | | | |

13. ASSESSMENT AND ACCREDITATION PROCEDURE AS PER NABL

Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks. It provides the feedback to laboratories as to whether they are performing according to technical competence as per guidelines of NABL (National Accreditation Board for Testing and Calibration Laboratories) The laboratory should carry out the following important tasks towards getting ready for accreditation from NABL.

1. Preparation of methodology in each experiment
2. Preparation of Standard Operating procedure for each equipment
3. Preparation of Laboratory Manual as per the guidelines specified by Combined Lab Team (CLT) headed by Principal/HOD/Dean/incharge.
4. Ensure Effective environmental conditions (temperature, humidity, storage and placement) in the laboratories by implementing proper housekeeping and cleaning of the equipments from dust, dirt etc.
5. Ensure Calibration of instruments/equipment (Only NABL accredited authorized laboratories provide calibration).
6. All the details of Calibration should be included in the format specified exclusively for calibration procedure.
7. Ensure proper implementation of all the documents, formats to be included in the lab manual.
8. Impart training for all the technicians working in labs about the importance of documentation, log sheets, operating procedure of the lab.
9. Incorporate Internal Lab audits for effective functioning of the laboratories. Audits may be once in a month or 3 months or at the end of the semester. The audit schedule will be decided by the Chairman and Principal of the CLT team.
10. Auditors should submit the detailed report of each lab duly signed to the Principal.
11. Each lab should maintain all the bills/invoices of each instrument or equipment in a separate file.
12. All the stock registers either consumable or non consumable should be updated whenever any purchases of consumables or equipment takes place.
13. All the safety precautions are properly displayed in front of each lab.

14. All the Lead experiments should be maintained separately in a record /record in a separate folder.
15. Based on Pre Assessment report submitted by auditor, corrective actions should be carried out by each lab in charge and that must be forwarded to concerned HOD and Principal.