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8.3 ELECTRICAL AND ELECTRONICS ENGINEERING LAB

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8.3 ELECTRICAL AND ELECTRONICS ENGINEERING LAB

8.3.1 OBJECTIVE AND RELEVANCE

The objective of this course is to study various electronic components and design of various electronic circuits like power supply, audio and power amplifiers. This course is considered as foundation course for electronics, electrical, computers, Mechanical and IT engineers. The subjects to be studied in higher semesters require thorough knowledge on electronic devices and circuits.

8.3.2 SCOPE

This laboratory session provides learning opportunities that should enable the student to do the following upon completion of this course:

- Set up a bias point in a transistor.
- Verify the working of diodes, transistors and their applications.
- Build a common emitter/base/collector amplifier and measure its Voltage gain.
- Understand the use of RPS and CRT.
- Learn to design different types of filters and its importance.

8.3.3 SYLLABUS - JNTU

PART – A (Only for Viva Voce Examination)

PREAMBLE

This part covers the experiments in Electronic Devices and Circuits Subject. The JNTU has prescribed 06 experiments in this part and these experiments does not belong to any unit of the syllabus but gives the general awareness of the various components, equipments and other details required to carry out the prescribed experiments without much difficulty to the students.

APPLICATIONS

The experiments prescribed in the syllabus are all application oriented mainly used for the development of DC regulated power supplies, CROs, audio and video amplifiers, frequency and function generators, etc.

EXPERIMENT NO. 1

Identification, specifications, testing of R, L,C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards.

OBJECTIVE
To study the behaviour of various passive electronic components, identification and their specifications.

PREREQUISITES
Definition and working of all above components.

THEORY

RESISTOR
In electronic circuit applications, resistance is inserted to oppose the flow of current and to produce the voltage drop. Resistors of different values and ratings are available from 1 ohm to several M ohm. Power ratings may vary from ¼ watt to 5 watt or more.

INDUCTOR
When current flows through a wire that has been coiled, it generates a magnetic field. The magnetic field reacts so as to oppose any change in the current. Inductance is used to control the flow of current and keep them at Steady state. Inductance is measured in Henrys.

CAPACITOR
Capacitors are used to store electric charge and the capacitance is measured in Farads. Types of capacitors are named according to dielectric used. Most common dielectrics are air, paper, mica, ceramic, and electrolytic.

POTENTIOMETERS
The small variable resistors commonly used in electronic circuits are called potentiometers. Potentiometers can be either linear or non-linear.

SWITCHES
Switch is a device which can connect two points in a circuit or disconnect.

a. **SPDT (Single Pole Double Throw):** There are two independent slots to be connected two throws but still connecting one pole
b. **DPDT (Double Pole Double Throw):** It connects two poles to two throws.
c. **SPST (Single pole Single Throw):** It connects one pole to one throw.
d. **DPST (Double pole Single Throw):** It connects two poles to one throw.

GANG CAPACITOR

Gang capacitor is nothing but stack of several capacitors connected by a common knob. If you change the knob position then automatically the effective capacitance will be changed.

RELAYS

Relays are primarily switching devices employed to control large power or to perform switching operation. Relays are current operated devices. The current required to operate the relay depends on the application.

BREAD BOARDS

Bread board is a plastic board with internal wirings connected horizontally and vertically which facilitates making power supply and ground connections vertically and horizontally.

DESCRIPTION

a. Introduction to all electrical and electronic components with color coding and specifications- 30min.
b. To measure the corresponding values of various electrical and electronic components
c. Identifying the components based on its specifications

APPLICATIONS

Experiment deals with various devices which are mainly used for design and construction of DC power supplies, regulated power supplies and other devices such as CRO.

EXPERIMENT NO. 2

Identification, Specification and Testing of Active Devices, Diodes, BJTs, Low power JFETs, MOSFETs, Power Transistors, LEDs, LCDs, Optoelectronic Devices, SCR, UJT, DIACs TRIACs, Linear and Digital ICs

OBJECTIVE

To identify and testing procedure for various active devices like BJT, FET, SCR, UJT., DIACs TRIACs, Linear and Digital ICs etc., and to study their pin diagrams, operations and characteristics.

PREREQUISITES

Definition, Operation of all active and passive Devices

DESCRIPTION

a. Introduction to all components-30 min
b. Identification, Specification, testing procedure for active devices
c. Operating principles of all active devices
d. Study of pin configuration of various active devices.

APPLICATIONS

Experiment deals with various devices which are mainly used for design of power amplifiers, audio amplifiers and other related electronic industrial controllers using SCR, UJT, etc.

EXPERIMENT NO. 3

Soldering Practice – Simple circuits using active and passive components.

OBJECTIVE

To make the students familiarize with various soldering techniques.

PREREQUISITES

Procedure to use soldering gun, lead, keeping flux, etc. for different electronic components.

THEORY

Soldering is generally required to ensure permanent electric connections. Wires are wrapped together then solder is melted onto the wire joints. When heat is removed the solder and wire becomes cool, making the soldered joint look like a solid piece of metal.

DESCRIPTION:

a. Introduction to soldering practice – 30 min
b. Procedure of soldering for electronic components like resistors, inductors, capacitance, simple circuits.
c. Soldering of active components like transistors, FET etc.

EXPERIMENT NO. 4

Single layer and Multilayer PCBs (Identification and utility)

OBJECTIVE

To identify different PCB layers for various applications.

PREREQUISITES

Method of soldering.

THEORY

PCB (Printed Circuit Board.: It is used to avoid all disadvantages of conventional bread board. They are small in size and efficient in

performance. There are two types of boards: single layer and multilayer PCB. Soldering is done on one side only in single layer PCBs, while multilayer PCB can be viewed as a composite structure of several single layer PCBs. Single sided are used for general purpose application. Multi layer PCBs are used for complex circuits where more number of components are to be soldered in a small piece of PCB.

DESCRIPTION:

a. Introduction to different types of PCBs– 30 min.
b. Procedure of soldering on PCBs, for electronic components like resistors, inductors, capacitance etc.
c. Soldering of components on multilayer PCB.

EXPERIMENT NO. 5

Study of operation of

- **Millimeters (Analog and Digital)**
- **Function Generator**
- **Regulated Power Supplies**

OBJECTIVE

To study the operation of devices like multimeter, function generators and RPS.

PREREQUISITES

Specifications and working of multimeters function generators and RPS.

THEORY

i. Analog and Digital multimeters are used to measure voltage, current and resistance values. In analog multimeter, indicating instruments are used to point the corresponding values of V, I and R. The digital multimeters use LCD for indicating different values according to the ranges provided on the instrument.

ii. Function Generators are electronic instruments used to provide input frequency and voltage to various electronic circuits. There is a provision to generate sinusoidal, square and triangular waveforms at convinent frequencies in a required range for electronic circuits.

iii. Regulated Power Supplies : These are DC regulated power supplies and provide DC voltage for Electronic Circuits. Usual ranges are 0 to 30 Volts at 2 Amps, and 0 to 15 Volts.

DESCRIPTION

a. Introduction to equipments
b. Operation of equipments
c. Measuring methodology

EXPERIMENT NO. 6
Study and operation of CRO

OBJECTIVE

To study the different operating modes of CRO.

PREREQUISITES

Working principle of Cathode Ray Tube.

DESCRITPTION

a. Block diagram
b. Types of CROs
c. Front panel controls
d. Observation of waveforms
e. Measurement of basic quantities
f. Measurement of unknown frequency and phase angle
g. Lissajous patterns
h. Component Testing

PART – B

UNIT - I

EXPERIMENT NO. 1
PN Junction diode characteristics (Forward bias, Reverse bias)
(JNTU Sl. No. 1)

OBJECTIVE
Experimental determination of junction diode characteristics.

PREREQUISITES
Theoretical background of diode and V-I characteristics in forward and reverse bias mode.

DESCRIPTION
a. Introduction to experiment-30 min.
b. To plot the V-I characteristics of junction diode in forward bias mode
c. To plot the V-I characteristics of junction diode in reverse bias mode

APPLICATIONS
Use for design and construction of power supplies.

UNIT - II

EXPERIMENT NO. 2
Zener diode characteristics. **(JNTU Sl. No. 5)**

OBJECTIVE
Experimental determination of zener diode characteristics.

PREREQUISITES
Theoretical background of zener diode and its characteristics.

DESCRIPTION
a. Introduction to experiment-30 min.
b. To plot the V-I characteristics of zener diode in forward bias mode.
c. To plot the V-I characteristics of zener diode in reverse bias mode and find its break down voltage value.

APPLICATIONS
Design and construction of Regulated DC power supplies.

UNIT – III

EXPERIMENT NO. 3
Rectifier without filters (Full wave and half wave) (JNTU Sl. No. 7)

OBJECTIVE
Experimental determination of conversion efficiency, ripple factor of half wave and full wave rectifiers without filter.

PREREQUISITES
Theoretical background of rectifiers.

DESCRIPTION
a. Introduction to experiment-30 min
b. Determine the efficiency, ripple factor etc; for half wave rectifier
c. Determine the efficiency, ripple factor etc; for full wave rectifier
d. Compare theoretical values of efficiency, ripple factor etc., with experimental values.

APPLICATIONS
Design and construction of Regulated DC power supplies.

UNIT – IV

EXPERIMENT NO. 4
Rectifier with filters (Full wave & Half wave) (JNTU Sl. No. 6)

OBJECTIVE
Experimental determination of conversion efficiency, ripple factor of a diode in half wave and full wave rectifier with filter circuits

PREREQUISITES
Theoretical background of rectifiers and filters.

DESCRIPTION
a. Introduction to experiment-30 min
b. Determine the efficiency, ripple factor etc., using Capacitor-filter for half wave and full wave rectifier
c. Compare theoretical values of efficiency, ripple factor etc., with experimental values

UNIT – V

EXPERIMENT NO. 5
Transistor CE characteristics (Input and Output)
(JNTU Sl. No. 2)

OBJECTIVE

To study the behaviour of transistor connected in CE configuration and trace the characteristics

PREREQUISITES

Theoretical background of transistor in CE configuration.

DESCRIPTION

a. Introduction to experiment-30 min
b. Study the input characteristics of transistor in CE configuration
c. Study the output characteristics of transistor in CE configuration

APPLICATIONS

Design and development of audio and video amplifiers.

UNIT – VI

EXPERIMENT NO. 6
STUDY AND OPERATION OF CRO (JNTU Sl. No. 3)

Objective

To study the different operating modes of CRO.

Prerequisites

Working principle of Cathode Ray Tube.

Description

a. Block diagram
b. Types of CROs
c. Front panel controls
d. Observation of waveforms
e. Measurement of basic quantities
f. Measurement of unknown frequency and phase angle
g. Lissajous patterns
h. Component Testing

8.3.5 REFERENCE BOOKS

1. Electronic Devices and Circuits, Jacob Millman, Christas C. Halkias, Tata Mc Graw Hill, 1998.
2. Electronic Devices and Circuits, Robert L. Boylestad, Louis Nashelsky, Prentice Hall of India Pvt. Ltd., 9th Edition, 2006
3. Electronic Devices and Circuits,T.F. Bogart Jr.J.S.Beasley and G.Rico, Pearson Education 6th edition, 2004
4. Principles of Electronic Circuits, S.G. Burns and P.R.Bond, Galgotia Publications, 2nd Edition, 1998.
5. Microelectronics, Millman and Grabel, Tata McGraw Hill, 1988.
6. Electronic Devices and Circuits, K. Lal kishore, B S Publications, 2nd Edition, 2005.
7. Electricity Electronics Fundamentals, A TEXT - LAB MANUAL - Fourth Edition Paul B.Zbas.Joseph Sloop, TMH.
8. Electronic components, D.V.Prasad, PPH Publications.
9. Practical's in basic electronics, G.K. Mithal, G.K. Publication.
10. Electronic Devices and Circuits by Shalivahana and valvaraj.

8.3.6 WEBSITES

1. www.reed.electronics.com
2. www.uoquelph.ca/nantoon/circ
3. www.ece.ufl.edu
4. www.circuitmaker.com
5. www.ciebookstore.com
6. www.neptal.com

8.3.7 EXPERTS' DETAILS

INTERNATIONAL

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8.3.8 MODEL LAB SCHEDULE

Batch	03.10.14	10.10.14	17.10.14	24.10.14	31.10.14	04.11.14	14.11.14	21.11.14
B1-B30	Part A Exp-1,2,3	Part A Exp-4,5,6	Part B Exp-1,2	Exp-3	Exp-4	Exp-5	Exp-6	**Internal**