

UPDATED SCHEME OF EXAMS. & SYLLABI FOR B.SC.

Course: Bachelor of Science (B. Sc.) 1st year

Subject: Electronic Equipment Maintenance

Scheme of Examination for Semester 1 & 2

(i) **Theory: Two papers of 30+10* = 40 marks each in each semester.**

Note: Common for both the Theory papers:

The syllabus in each paper is divided into 4 units. Two questions will be set from each unit. A student is to attempt 5 questions in all selecting one question from each unit. Question No. 1 is compulsory which will be based on 4 units.

* For each paper question paper will be of 30 marks and 10 marks in each theory paper are awarded through internal assessment in each semester.

(ii) **Practical: 80 marks**

Note: On Practicals:

1. The practical examination will be held at the end of second semester in two sessions of three hours each with first session starting in the evening of the first day and second session in the following morning.

2. Distributions of marks is as under:

Experiment Performed: **20+20**

Lab Record: **20**

Viva Voce: **10+10**

(iii) **On Job Training: 60**

The training will be of 4 weeks duration and will be undertaken in an Industry/Research Laboratory approved by the Training-In-Charge. After the successful completion of the training, the student will be required to submit a Training Report before the start of the next session. The training will be evaluated by a panel of two examiners (one external and one internal) by conducting a Viva-Voce on the basis of the Report.

Semester-I

Subject: EEM

Paper-I (Theory)

Nomenclature: Principles of Electronics-I

Max. Marks: 30+10*

Time: 3hrs.

Unit-I

Number Systems: Introduction to Decimal, Binary, Octal, Hexadecimal Number Systems and their inter-conversions; BCD codes, Excess-3 codes, Gray codes, Cyclic codes, code conversions; parity, binary arithmetic, 1's and 2's compliments and 9's and 10's compliments.

Unit-II

Boolean Algebra: postulates and theorems of Boolean algebra, De-Morgan's Theorem, Reducing Boolean expressions.

Logic Gates: Positive and Negative Logic, Basic Logic Gates : AND, OR, NOT (symbol, truth-table, circuit diagram, working); NAND, NOR, EX-OR, EX-NOR (symbol, truth-table).

Unit-III

Minimization Techniques: Introduction, SOP and POS form of Boolean functions, Karnaugh Map simplifications (upto 4 variables), implementations of SOP and POS form using NAND and NOR gates.

Unit-IV

Combinational circuits: half adder, full adder, 8421 adders, 1's & 2's complement adder/subtractor, Excess-3 adder, multiplexer, demultiplexer, encoders and decoders.

Sequential circuits: Flip-Flop (RS, JK, Master-Slave JK, D and T-type), Shift Register, Binary Counters, Modulo-N counter, up-down counter.

Ref.:

Digital Electronics by R.P. Jain

Semester-I

Subject: EEM

Paper-II (Theory)

Nomenclature: Electronic Devices, Components and Assemblies-I

Max. Marks: 30+10*

Time: 3hrs.

Unit-I

Passive Components: Resistors, Capacitors, Inductors, Transformers, Relays, Fuses (their types, applications, common faults & testing).

Introduction to Semiconductors: Energy Band Diagram, Conductors, Semiconductors, Insulators, Intrinsic and Extrinsic Semiconductors(P&N), currents in semiconductors, Diffusion Junction, Depletion Layer, Barrier Potential.

Junction Diodes: Rectifying diode, Forward and reverse bias characteristics, breakdown phenomenon, Zener Diodes, Varactor Diode, Photo Diode, Light Emitting Diode.

Unit-II

Rectifiers: Half wave, Full wave, Bridge (calculation of ripple factor and rectification efficiency), Filters (L, C, LC, π), Clipping and Clamping circuits.

Bipolar Junction Transistor: Basic working principle, Input and Output Characteristics, Basic configurations. Biasing, Operating point, Load line, Stabilization of Operating Point, Self-Bias Arrangement.

Unit-III

Amplifiers: Classification of amplifiers, Class-A, B, AB and C Amplifiers, Cascading of amplifiers, RC Coupled amplifiers. Properties of amplifiers (distortion, noise, thermal noise, shot noise, noise figure).

Feedback in Amplifiers: Feedback concept, transfer gain with feedback, Effect of Negative Feedback on amplifiers performance.

Unit-IV

Field Effect Transistors: JFET, basic working principle, I/O Characteristics, pinch off voltage, parameters, MOSFET, basic working principle, Characteristics.

Basic Measuring Instruments: Regulated power supply, Analogue Multimeter, Digital Multimeter, Cathode Ray Oscilloscope, Function Generator (functional block diagram, basic working principle, measuring quantities).

Ref.:

1. Basic Electronics and Linear Circuits by Bhargava & Kulshreshtha (TTTI)
2. Integrated Electronics by Millman and Helkian

Semester-II

Subject: EEM

Paper-I (Theory)

Nomenclature: Principles of Electronics-II

Max. Marks: 30+10*

Time: 3hrs.

Unit-I

Network Analysis: Kirchoff's Voltage Law, Kirchoff's Current Law, Loop and Node Method, Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem,

Unit-II

Two Port Networks: Impedance Parameters, Admittance Parameters, Hybrid Parameters, Inverse Hybrid Parameters, Transmission Parameters, Inverse Transmission Parameters, Transformation of parameters, Basic idea of Transducers, Strain Gauge, photo voltaic cell, LDR, Photodiode and phototransistors (qualitative only).

Unit-III

Modern Electronic Equipment & Maintenance Concepts: Quality, Failures, Failure Rate, Mean time between failures, mean time to fail, maintainability, mean time to repair, availability, fail safe design, maintenance policy, stages of maintenance.

Maintenance Aids & Records: Tools, Importance of Service Manual and Component Data Book, workshop requisites, approach of a service engineer.

Unit-IV

Soldering and Desoldering Techniques: Introduction, Solder Joint, Dry Solder Joint, Cold Solder Joint, Good and Bad Solder Joints, Soldering Material, Soldering Tools, Soldering Iron, Soldering Gun, Soldering Station, Ultrasonic Soldering, Tools used for Desoldering, Desoldering Techniques, Soldering Techniques, Testing a Soldering Joint, precautions during Soldering and Desoldering.

Ref.:

1. Circuits and Networks by A. Sudhakar and Shyam Mohan
2. Instrumentation Repair and Maintenance by R.G. Gupta

Semester-II

Subject: EEM

Paper-II (Theory)

Nomenclature: Electronic Devices, Components and Assemblies-II

Max. Marks: 30+10*

Time: 3hrs.

Unit-I

Unijunction Transistor: Basic Working Principle, Characteristics, Applications as a switch and as time base generator.

Power Control Devices: Four Layer Diode (PNPN), Silicon Controlled Rectifier(SCR), Triac, Diac (Principle, Characteristics and Applications).

Unit-II

Operational Amplifiers: Basic idea of an OPAMP with black box concept, differential amplifier, emitter coupled differential amplifier, Transfer characteristics of a differential amplifier, IC 741 various parameters, offset error voltages and currents, temperature drift of input offset voltage and current, inverting and non-inverting amplifiers, virtual ground, summing, difference, integrator, differentiator.

Unit-III

Oscillators: Positive Feedback, Barkhausen criteria, Phase-Shift Oscillators, Wein Bridge Oscillators, Hartley's and Colpitt's Oscillators, Crystal Oscillators.

Power Supplies: Regulated power supply, zener regulated power supply, transistorised series and shunt regulated power supply, block diagram of IC 723, regulated supply using IC 723, three terminal regulator ICs, IC based power supply study.

Unit-IV

IC555: operation and applications (Monostable and Astable Multivibrators).

Introduction to Communication System: Basic Principle and operation of communication system, modulation, AM and FM (principle, modulation index, modulation bandwidth, balanced modulator for AM/FM, reactance modulator).

Ref.:

1. Integrated Electronics by Millman and Helkian
2. Operational Amplifier by Gyakwar
3. Electronic Communication System by George Kenedy

SEMESTER 1 & 2

Subject: EEM

Paper-III (Practical)

Max. Marks: 80

Time: 3+3 hrs.

List of Experiments:

Note: Minimum 5 experiments are to be performed from each section.

Section-A (Basic Electronics Devices Laboratory)

1. Practical use of:
 - (a) Multimeter (measurement of voltage, current, resistance).
 - (b) Power Supply (study the variation in line and load voltage)
 - (c) Oscilloscope (voltage and frequency measurement).
2. Study of Electronic Components:
 - (a) Resistor (study the types, colour coding, wattage rating, potential divider arrangement).
 - (b) Capacitors (study the types, colour coding, working voltage).
 - (c) Switches, Relays, Fuse (basic function, types, usage, testing).
3. P-N Junction Diode (study the types, testing, manual study, V-I Characteristics and parameters).
4. Study of PN diode as wave clipping element.
5. Study of Zener Diode (testing, V-I Characteristics, design & study of voltage regulating properties).
6. Study of Transistors (types, testing, manual study, CB/CE/CC Characteristics, parameters).
7. Study of Amplifiers (Design of CB/CE/CC, find R_{in} , R_o , A_v , frequency response).
8. Design and testing of transistorised oscillators (any two):
 - (a) RC-phase shift
 - (b) Wein Bridge
 - (c) Hartley's
 - (d) Colpitt's

Section-B (Electronic Circuits Laboratory)

1. Familiarization with Breadboard, IC types, pin number, testing, IC Manual.
2. Familiarization with different types of LED's, seven segment displays. Study the use of 7447 BCD to seven segment decoder.
3. Verification of truth tables for two input AND, OR, NOT gates.
4. Design DTL NAND Gate using discrete components & verify its truth table.
5. Design TTL NAND Gate using discrete components & verify its truth table.
6. Study of Flip-Flop IC chips and designing of JK, D, T type flip-flops using IC7400.
7. Study of Shift Register using IC7476.

8. Study of Counter IC chips and design of divide by 2/5/10 counter.