

**B. Sc. I – Electronics**  
**SEMESTER-I**

**Paper I – Basic Electronics**

**(Total Marks 50)**

**Unit: 1 Passive Circuit Elements**

**10**

Definition of active and passive elements

Resistors: - Definition, symbol and color code method.

Types of resistors: -

Linear Resistors (Fixed): -Carbon composition, carbon ceramic, carbon film, wire wound.

Linear resistors (Variable): -Wire wound, Potentiometer, Preset.

Non-Linear resistors: - Thermistors, photo resistors and Varistors. [Specification and application]

Capacitors: - Definition, Capacitance, capacitive reactance ( $X_C$ ), Energy stored in a capacitor,

Charging and discharging of a capacitor, leakage current in capacitor, stray capacitance.

Types of capacitors: -

Fixed electrostatic capacitors: -ceramic, mica, plastic and paper

[Construction of ceramic capacitor only]

Fixed electrolytic capacitors: - Aluminum and Tantalum polycarbonate polyethylene.

Variable capacitors: -Air dielectric capacitor and Trimmers.

Inductors & Transformers:

Inductors: - Definition, symbol, Inductance, Inductive reactance ( $X_L$ ), Energy stored in an inductor Q-Factor.

Types of Inductors: - Air core, Iron core and ferrite core inductors.

Use of Inductors: - Filter chokes AFC & RFC and Variable inductor.

Transformers: - Principle and construction of transformer, Specification of transformer.

Types of Transformer: - Step-up, step-down transformer

Relays: - Principle, construction and working of electromagnetic relays

Types of Switches: (Explanation using Symbols)

**Unit: 2 Circuit Fundamental**

**10**

AC/DC Fundamentals:

Energy sources: - AC and DC sources, constant voltage and constant current source, and their inter-conversions, Reference direction for voltage and current.

Sources of DC voltage: Lead-Acid and Ni-Cd Battery: Construction, Chemical action, Current rating. Other DC sources (only names), Solar cell

A.C. Fundamentals: Types of AC, Important terms of AC: Cycle, Time period, Frequency, Amplitude, peak, Peak to peak value, R.M.S. value, Phase, Phase Difference.

Electric circuit, Active and Passive elements, Bilateral and unilateral element, Linear and non Linear element, Lumped and distributed element.

Basic Voltage and Current relations for R, L and C.

**UNIT:3 Network Theorems**

**10**

Basic laws and rules: - Ohm's law, Kirchhoff's laws, voltage and current divider rules, power in series and parallel circuits. Mesh-analysis method and Nodal analysis method (only for dc resistive circuit)

Network Theorems: - (only for dc resistive circuit)

Thevenin's Theorem, Norton Theorem, Superposition Theorem, Maximum power transfer

Theorem and Millman's Theorem.

#### **Unit 4: Principle of electrical machines**

**10**

Magnet Magnetism and its properties, Coulomb's law, magnetic line of force, Electromagnets, Right hand thumb rule, Dot and cross Convention, Magnetic field due to solenoid, Right hand thumb rule applied to a solenoid, Principle of operation of DC generator, Fleming's right hand rule, Fleming's Right rule under Various operating conditions, Magnitude of induced e.m.f. single turn alternator, Principle and operation of a DC motor, Magnitude of force, Direction of rotation of motor, Back e.m.f. and its significance, Armature Friction and voltage equation, Windings in DC motor, Principle of induction motor, Torque production in induction motor, Rotor slip and rotor efficiency.

#### **Books for Section I**

- |   |  |
|---|--|
| • Basic Electronics   | Bernard Grob                                       |
| • Basic Electronics solid state                             | B.L.Theraja(S.Chand& Company)                      |
| • Text book of Electrical technology vol- II                | B.L.Theraja(S.Chand& Company)                      |
| • Basic Electrical Engineering Vol. –II                     | P. S. Dhogal (Tata McGrath-Hill Pub.)              |
| • A text book of Applied Electronics                        | R.S.Sedha (S.Chand& Company)                       |
| • Basic Electronics and Linear circuits and S.C.Gupta (TMH) | N.N.Bharagava, D.C.Kulshreshtha                    |
| • Circuits and Networks: Analysis and synthesis.            | A.Sudhakar and Shyammohan (Tata McGrath-Hill Pub.) |
| • A course in Circuit Analysis                              | Soni and Gupta.                                    |
| • Linear Circuits.  | M.E. Valkenberg&Kinariwala.                        |
| • Electronics materials and components                      | Madhuri Joshi.                                     |

### **B. Sc. I – Electronics**

#### **SEMESTER-I**

#### **Paper II – Semiconductor Devices (Total Marks 50)**

##### **UNIT:1 Semiconductor diode: -**

**10**

PN junction, unbiased junction, formation of depletion layer and internal potential barrier, I-V characteristics of PN junction diode. Diode application, power and current rating of diode, effect of temperature on PN junction diode. Zener diode: - Breakdown mechanism, Zener and Avalanche Break down, Zener Diode as Voltage regulator. Specification of Zener diode, point contact diode, applications, effect of temperature on Zener diode. Photo diode, Varactor diode, LED [Construction and applications of Seven segment display, LCD].

##### **UNIT:2 BJT (Bipolar Junction Transistor): -**

**10**

Junction Transistor, Types, Construction of PNP and NPN Transistor. Configurations: - CB, CE and CC, I-V characteristics of CB and CE, definition of  $\alpha$  and  $\beta$ . Relation between  $\alpha$  and  $\beta$ , Leakage current in CB and CE and Relation between  $I_{CBO}$  &  $I_{CEO}$ .

**UNIT:3 Transistor Biasing and Thermal Stabilization: -**  
**10**

AC and DC Operating point, DC and AC load line, Need of transistor biasing and stability of Q point, Thermal instability. Biasing methods, Stability factor in potential divider biasing. Temperature compensation using single diode and two diodes, Transistor Rating and specifications for Typical transistor SL100, BC148 or BC548.

**UNIT:4 Special Semiconductor Devices : -**  
**10**

Field Effect Transistor: - JFET: - Structure and operation of n-channel FET. The volt-ampere characteristics of FET. FET parameters & Applications. MOSFETs: - Structure, operation and characteristics of MOSFETs & Applications. UJT and SCR: - Structure, operation, characteristics and Applications. TRIAC, DIAC- construction and applications.

**Books for Section II**

- Electronic Devices and Circuits J. Millman & C.C. Halkias (TMH)
- Electronic Devices and Circuits Allen Mottershead (PHI)
- A text book of Applied Electronics R.S. Sedha (S. Chand & Company)
- Basic Electronics and Linear circuits N.N. Bharagava, D.C. Kulshreshtha and S.C. Gupta (TMH)
- Semiconductor Approximation Malvino
- Principles of Electronics V.K. Mehta (New Edn.)
- Electronic Devices and Circuit Theory R. Boylestad & Louis Nashelsky.
- Electronic Devices Floyd

**B.Sc. I – Electronics**  
**Semester II**

**Paper III – Basic Digital Electronics**

**(Total Marks 50)**

**UNIT:1 Number systems: -**  
**10**

Number Systems: - Decimal, Binary, Octal, Hexadecimal number system and their inter-conversions.

1's and 2's complement of Binary Numbers, 9's and 10's complement.

*Binary Arithmetic*: - Addition, Subtraction, Multiplication and Division.

Binary codes: - 8421 code, Excess-3 code, Gray code, Alphanumeric codes ASCII and EBCDIC code. The parity Bit, bar code.

**UNIT 2: Logic Gates**  
**10**

Introduction to logic gates with IC's, Positive and Negative Logic.

DeMorgan's Theorems, The universality of NAND & NOR gate, TTL NAND gate, Specification of TTL logic family, current sinking & current sourcing, open collector TTL, CMOS Family and specifications, TTL-CMOS interface.

**UNIT: 3 Boolean algebra: -**  
**10**

Rules and Laws of Boolean Algebra, Boolean expressions for gate networks, Simplification of Boolean expressions, Sum of product and Product of sum method by using K-maps.

**UNIT:4 Arithmetic Circuit and Computer Organization: -**  
**10**

Ex-OR gate and Controlled invertors, half adder, Full adder, Parallel Binary adder, 8421 Adder, Excess 3 adder, half and full sub tractor.

Computer I/O devices, Key board, Monitor, Types of Printers. Computer Specification(Mention only Processor,speed,size of HDD,Size of memory)

**Reference books:**

- Digital Fundamentals Floyd.
- Digital Principles and Applications A.P.Malvino&D.P.Leach (TMH).
- Modern digital Electronics (2nd Edn.) R.P.Jain.
- Fundamentals of Computer V.Rajaraman.

**B.Sc. I – Electronics  
Semester II**

**Paper-IV Electronic Circuits**

**(Total Marks 50)**

**UNIT 1**

**10**

Half wave, full wave, bridge rectifiers and their performance parameters, study of filters. Concept of dual power supply.

**UNIT 2**

**10**

Transistor as an amplifier, classification of amplifiers as CE, CB and CC. Multistage amplifier: Different coupling schemes: RC coupling, transformer coupling, direct coupling  
Concept of differential amplifier.

**UNIT 3**

**10**

Power Amplifiers: Class – A, B and C amplifiers, Class B Push-pull amplifier. Complementary symmetry push – pull amplifier. Types of distortions in power amplifiers.

**UNIT 4**

**10**

Feedback circuit and Oscillators: Theory of feedback circuit. Effects of negative feedback. Analysis of current series feedback and voltage series feedback. Oscillators: Barkhausen’s criterion, RC oscillators: phase – shift oscillator, Wien Bridge oscillator.  
LC oscillators: Hartley oscillator, Colpitt’s oscillator. Crystal oscillator.

**Reference Books:**

1. A Text Book of Applied Electronics By R. S. Sedha (S. Chand & Co)
2. Electronics Devices & Circuit : An Introduction By Allen Mottershead (PHI)
3. Electronics Devices & circuit By Jacob Millman & Christos, C. Halkias (TMH)
4. Principles of Electronics By V. K. Mehta
5. Electronics Design From concept to reality By Martin S. Roden Gordon L. Carpenter  
William R. Wicserman Fourth Edition SPD (Shroff Publishing and Distributors pvt.Ltd.Colcata)

**Practical for B.Sc. Part-I(Electronics)**

**GROUP A**

1. Study of Components:

- i) Identification of Active and Passive components
  - ii) Study of Relay Interfacing with Transistor-switch
  - iii) Study of LED (Calculation of Series resistor for 5V, 6V, 12V)
2. Study of CRO (Amplitude, Frequency, Phase measurement)
  3. Verification of Kirchhoff's Laws
  4. Verification of Thevenin's and Superposition theorems
  5. Study of different types of DC Motors and their characteristics.
  6. Study of different types of AC Motors and their characteristics
  7. Study of diode Characteristics (Si /Ge/ Point contact diodes)
  8. Study of Zener Diode Characteristics (Temperature effect)
  9. Graphical determination of  $\alpha$  and  $\beta$
  10. Study of Transistor Biasing (Potential divider)
  11. Study of FET Characteristics

### **GROUP B**

12. Study of Basic Gates
13. Study of Universal Gates (NAND/NOR)
14. Verification of DeMorgan's Theorems
15. Study of half and Full Adder
16. Identification of computer I/O Devices, Preparing own Bio-data using MS-WORD
17. Internet Browsing
18. Study of Full Wave Rectifier (Bridge)
19. Study of  $\pi$  filter
20. Study of CE amplifier
21. Study of emitter follower
22. Study of Hartley Oscillator/Colpitt's Oscillator
23. Study of Phase shift oscillator
24. Study of Wien Bridge Oscillator

**Paper Equivalence:**

Semester –I	
Old Paper	New Paper
Paper I:- Basic electronics	Paper I – Basic Electronics
Paper II:- Semiconductor Devices	Paper II:- Semiconductor Devices
Semester –II	
Paper III- Digital Electronics-I	Paper III- Basic Digital Electronics
Paper IV- Digital Electronics-II	Paper IV- Electronics Circuits

**Dr. V. C. Mahajan**  
**Chairman**  
**B.O.S. (Electronics)**