

**Diploma in Computer Science and Engineering****First Semester****Subject: 9CS13 Concepts of Electrical and Electronics Engineering****Contact Hrs / Week: 4****Contact hrs / Semester: 64****Contents****SECTION I****Electrical Engineering**

- 1**            **ELECTRIC CURRENT AND CIRCUITS (DC)**
  - 1.1          Current, voltage and Resistance --- Definition, unit & how they are measured
  - 1.2          Ohm's law - limitations
  - 1.3          Kirchoff's voltage and current laws.
  - 1.4          Series and Parallel combination of circuits. Practical examples of these circuits
  - 1.5          Power, energy, units and their relation, how they are measured.
  
- 2**            **ELECTROSTATICS**
  - 2.1          Electric charge, field, permittivity
  - 2.2          Coulomb's law
  - 2.3          Capacitance --- series and parallel combination
  - 2.4          Meaning of charging and discharging of capacitors
  
- 3**            **ELECTRO MAGNETIC INDUCTION**
  - 3.1          Faraday's laws and Lenz's law
  - 3.2          Self and mutual induction and emf
  
- 4**            **AC FUNDAMENTALS**
  - 4.1          Definition of sine wave. Equation of AC sine wave. Comparison with DC
  - 4.2          Average value, maximum value, RMS value and form factor for sine wave
  - 4.3          Types of reactances
  - 4.4          Current and voltage in R, RL, RC and RLC circuits
  - 4.5          define power factor
  - 4.6          What is single phase & 3 phase, phase, phase difference and phase angle.

**SECTION II**

- 5**            **TRANSFORMERS**
  - 5.1          Principle of operation of transformer
  - 5.2          Turn ratio, current and voltage ratios.
  - 5.3          Losses in transformer
  - 5.4          Types of transformers, core and shell type, step-up and step-down.
  - 5.5          Transformers for SMPS.
  
- 6**            **PROTECTION OF ELECTRIC AND ELECTRONIC CIRCUITS**
  - 6.1          Fuses
  - 6.2          Grounding
  - 6.3          Protecting computer system against power transients
  
- 7**            **MOTORS**
  - 7.1          Stepper motor, spindle motor in disk drive
  - 7.2          Servometers
  - 7.3          Brushless DC motors

**SECTION III**

- 8 ELECTRONIC COMPONENTS**
  - 8.1 Brief idea like- types,symbols,specifications,general idea of construction characteristics and applications of Resistors,capacitors,inductors & switches
  
- 9 BASICS OF ELECTRONICS**
  - 9.1 Conductors,semiconductors and insulators
  - 9.2 What is electron emission? Types.
  - 9.3 Semi- conductor- Intrinsic and Extrinsic (P and N type)
  - 9.4 PN junction as semi conductor diode
  - 9.5 Applications as half wave, full wave and bridge rectifiers
  - 9.6 What are filters? Types of filters
  - 9.7 Zener diode characteristics and applications as voltage regulator
  - 9.8 PNP and NPN bipolar transistor -- Principle & working, basic transistor modes, applications of transistor as switch and amplifier
  - 9.9 Defination, Classification and applications of (no constuction details required) Multivibrator, Oscillator, Comparator
  - 9.10 Power Supplies -
    - 9.10.1 Block diagram description of Linear power supplu unit
    - 9.10.2 Block diagram description of SMPS, Merits & demrits
    - 9.10.3 Need for UPS, Block diagram decription of online & offline UPS, Merits & demrits
    - 9.10.4 Need for heat sinks
  
- 10 OP-AMP**
  - 10.1 Block diagram - characteristics
  - 10.2 Inverting and non- inverting operational amplifiers
  - 10.3 Summing amplifier
  - 10.4 Integator and Differentiator

**Table of Specifications :**

SECTION	TOPIC	HOURS	MARKS
I	1. Electric currents and circuits	4	12
	2. Electro statics	4	12
	3. Electro magnetic induction	4	12
	4. AC fundamentals	4	12
II	5. Transformers	4	12
	6. Protection of electric and electronic ckts.	3	6
	7. Motors	3	6
III	8. Electronic Components	10	25
	9. Basic Electronics	20	40
	10. OP-AMP	4	8
	Tests and Assignment	4	
<b>TOTAL</b>		<b>64</b>	<b>145</b>

**Reference Books :**

- |                              |                 |
|------------------------------|-----------------|
| 1. Electrical Technology     | - Thereja       |
| 2. Electronic Components     | - K Padmanabhan |
| 3. Electronic Components     | - D V Prasad    |
| 4. Principles of Electronics | - V K Mehta     |

**Specific Objectives****SECTION I****Electrical Engineering****1 ELECTRIC CURRENT AND CIRCUITS (DC)**

- 1.1 Current, voltage and Resistance, specific resistance, Law of resistance, Definition, unit, simple problems, how to measure
- 1.2 Definition of Ohm's law - limitations, problems
- 1.3 State Kirchoff's voltage and current laws, Explain with example
- 1.4 Analyse Series and Parallel combination of circuits Practical examples of these circuits.
- 1.5 Power, energy, units and their relation, how they are measured.

**2 ELECTROSTATIC**

- 2.1 Definition of Electric charge, field, permittivity, Electric flux, Electric flux density, Dielectric, Dielectric constant, Absolute permittivity
- 2.2 State Coulomb's law, analyse with equation, problems
- 2.3 Definition of Capacitance and factors on which capacitance of capacitor depends, derive series and parallel combination circuits, problems
- 2.4 Explain Meaning of charging and discharging of capacitors

**3 ELECTRO MAGNETIC INDUCTION**

- 3.1 State Faraday's laws and Lenz's law
- 3.2 Define Self and mutual induction and types of emf, Expression for dynamically induced emf

**4 AC FUNDAMENTALS**

- 4.1 Definition of sine wave, cycle, frequency, time period, amplitude, Equation of AC sine wave, Comparison of AC and DC
- 4.2 Definition of Average value, maximum value, RMS value and form factor for sine wave
- 4.3 Define reactances
- 4.4 Analyse Current and voltage in R, RL, RC and RLC circuits
- 4.5 Define power factor
- 4.6 Define single phase, 3 phase, phase, phase difference and phase angle.

**SECTION II****5 TRANSFORMERS**

- 5.1 Study basic Principle of operation of transformer
- 5.2 Define Turn ratio, current and voltage ratios.
- 5.3 Losses in transformer
- 5.4 Types of transformers, Construction of core and shell type, Difference between core and shell, define step-up and step-down, Efficiency, Explain Auto transformer, Derive equation of a transformer.
- 5.5 Study block diagram of Transformer SMPS, simple problems

**6 PROTECTION OF ELECTRIC AND ELECTRONIC CIRCUITS**

- 6.1 Define Fuse, Explain Types of fuses.
- 6.2 Define Grounding or earthing, Explain types of earthing, Pipe earthing, plate earthing
- 6.3 Discuss Protecting computer system against power transients

**7 MOTORS**

- 7.1 Study briefly principle and construction of permanent magnet Stepper motor, spindle motor in disk drive
- 7.2 Define Servomotors and study basic principle of servo mechanism
- 7.3 Study construction of Brushless DC motor

### SECTION III

## 8 ELECTRONIC COMPONENTS

### 8.1 Resistors

Specification of resistors--tolerance power rating, thermal stability, types of resistors and their symbols  
 Discuss the constructional features of carbon composition and wire wound resistor, variable resistors, applications of variable and fixed resistors,  
 Discuss colour code method and example  
 Principle operation of LDR, VDR, Thermistors

### 8.2 Capacitors

Classification of capacitors, Discuss principle of mica, ceramic, paper, electrolytic capacitor,  
 Discuss variable capacitor, air capacitor, trimmer and padder

### 8.3 Inductors

Mention the types and applications of inductors

### 8.4 Switches

List the types of switches

## 9 BASICS OF ELECTRONICS

- 9.1 Define Conductors, semiconductors and insulators with energy band diagram
- 9.2 What is electron emission? Discuss working principle of Thermionic, Photo, Field, Secondary Emission
- 9.3 Discuss Intrinsic and Extrinsic types (P and N type),  
 Define Doping, Define Majority and Minority Carriers
- 9.4 Working of PN junction in Forward bias and Reverse bias,  
 Define Depletion Region, Barrier Voltage, Discuss V-I Characteristic of P-N junction
- 9.5 working principle of Half wave, full wave and bridge rectifiers
- 9.6 Study pi type, capacitor type and inductor type of filters
- 9.7 Discuss V-I characteristics of Zener Diode and applications as voltage regulator
- 9.8 Working of PNP and NPN transistor, Define transistor terminals,  
 Discuss transistor modes  
 Transistor application as an amplifier and switch
- 9.9 Definition, classification and application of multivibrator, oscillator, comparator
- 9.10 Study block diagram of linear power supply  
 Study block diagram of SMPS. Mention the merits and Demerits  
 Discuss need of UPS and study block diagram of on line and off line UPS,  
 Discuss Merits and demerits  
 Difference between online UPS and offline UPS  
 Discuss need of heat sink

## 10 OP-AMP AND OTHER LINEAR IC'S

- 10.1 Mention the characteristics of OP-AMP, Explain block diagram of OP-AMP,  
 Mention the application of OP-AMP, Define CMRR, slew rate
- 10.2 Working principle of Inverting and non-inverting operational amplifiers
- 10.3 Discuss working principle of summing amplifier
- 10.4 Working principle of Integrator and Differentiator



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