

**R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT**  
(An Autonomous College U/s UGC Act 1956)

**B.Tech. SEMESTER-I, SEMESTER END EXAMINATION - WINTER 2024**

**Subject Code: 1EL101**

**Date: 16-12-2024**

**Subject Name: BASIC ELECTRICAL ENGINEERING**

**Time: 11:00 AM to 01:30 PM**

**Total Marks: 70**

**Instructions**

1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Write answers of **Section A** and **Section B** in **separate answer books**.
3. Attempt all questions from both **Section A** and **Section B**.
4. Each section carries **35 marks**, with a total of **70 marks** for the examination.
5. The figures to the right of each question indicate full marks, make suitable assumptions with justification.
6. BL - Bloom's Taxonomy Levels (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

**SECTION A**

	<b>Marks</b>	<b>BL</b>	<b>CO</b>
<b>Q.1 Objective-Type Questions</b>	<b>[05]</b>		
(a) Which component opposes the flow of current in a circuit?	<b>1</b>	<b>R</b>	<b>3</b>
(i) Inductor			
(ii) Capacitor			
(iii) Resistance			
(iv) Battery			
(b) In an inductive circuit, the current _____ the voltage?	<b>1</b>	<b>E</b>	<b>3</b>
(i) Lags			
(ii) Lead			
(iii) is less than			
(iv) is greater than			
(c) Which type of earthing is recommended for domestic electrical systems?	<b>1</b>	<b>R</b>	<b>5</b>
(i) Road Earthing			
(ii) Pipe Earthing			
(iii) Grid Earthing			
(iv) Strip Earthing			
(d) For three phase circuit, the phase angle is always _____	<b>1</b>	<b>E</b>	<b>4</b>
(i) 270°			
(ii) 120°			
(iii) 240°			
(iv) 0°			

- (e) In a parallel circuit, how does the total current compare to the individual branch currents? **1 R 3**
- (i) It is the average of the branch currents      (ii) It is the maximum branch current
- (iii) It is the sum of the branch currents      (iv) It is equal to the largest branch current

**Q.2 Attempt Any Two [10]**

- (a) Define the following terms for AC (alternating current) signal: **5 R 3**  
 (i) Frequency (ii) Time Period (iii) Amplitude (iv) Peak Factor (v) Form Factor
- (b) Explain the phenomena of generation of Alternating voltages and currents and derive expression for it with suitable diagrams **5 E 3**
- (c) Prove that in a purely capacitive circuit power consumed is zero when a.c. voltage is applied. Draw relevant phasor diagram and waveforms. **5 E 3**

**Q.3 Attempt Any Two [10]**

- (a) Explain the R-L-C series resonance phenomena. **5 U 4**
- (b) Derive the relation between line-voltage and phase-voltage for three-phase four wire star connection network. **5 E 4**
- (c) Explain the two wattmeter method for measurement of 3-phase power. **5 U 4**

**Q.4 Attempt Any Two [10]**

- (a) Explain with neat sketch general construction of cable. **5 U 5**
- (b) State the different methods of earthing and explain any one of them. **5 U 5**
- (c) Calculate the electricity bill amount for a month of April, if 4 bulbs of 40 W for 5 h, 4 tube lights of 60 W for 5 h, a TV of 100 W for 6 h, a washing machine of 400 W for 3 h, a water pump of 0.5 HP for 15 minutes are used per day. The cost per unit is Rs 3.50. Consider 1 HP = 746 watts **5 E 5**

## SECTION B

Marks BL CO

### Q.5 Objective-Type Questions

[05]

(a) In a DC circuit with a resistor of  $10\Omega$  and a voltage source of  $20V$  in series, what is the power dissipated by the resistor? 1 N 3

(i)  $2W$  (ii)  $20W$

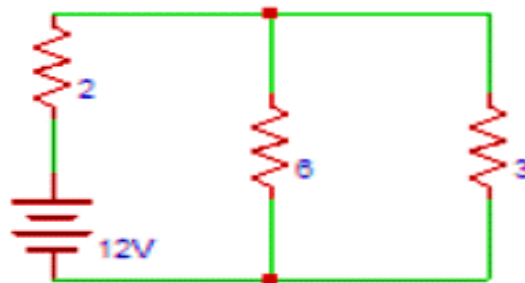
(iii)  $40W$  (iv)  $400W$

(b) Which of the following configurations would result in the highest total resistance? 1 U 4

(i) Three resistors in series (ii) Three resistors in parallel

(iii) Two resistors in series and one in parallel (iv) Two resistors in parallel and one in series

(c) Find the current through  $3\Omega$  resistor in the circuit shown below.



1 A 3

(i) 1 (ii) 2

(iii) 3 (iv) 4

(d) What is the unit of self-inductance? 1 R 1

(i) Farad (ii) Ohm

(iii) Tesla (iv) Henry

(e) What type of losses occur due to circulating currents within the core of a magnetic material? 1 U 2

(i) Hysteresis losses (ii) Core losses

(iii) Eddy current losses (iv) Resistive losses

### Q.6 Attempt Any Two

[10]

(a) Describe the process of Star-Delta conversion and its application in circuit analysis. 5 R 1

- (b) Explain the differences between series and parallel circuits. Provide examples of each type of circuit. 5 A 3
- (c) Explain the concept of electrical energy and power. How are they related? Give examples of how electrical energy is converted to other forms in everyday applications. 5 U 4

**Q.7 Attempt Any Two [10]**

- (a) State and explain Kirchhoff's Voltage Law (KVL). Use this law to analyze a circuit with two loops and three resistors, showing each step of your calculation. 5 R 2
- (b) Explain the concepts of self-inductance and mutual inductance. Derive the mathematical expressions for each and discuss the factors affecting them. U 2
- (c) Define electric field intensity, electric flux, and electric flux density. 5 R 1

**Q.8 Attempt Any Two [10]**

- (a) Using Fleming's Right-Hand Rule, describe the direction of induced current in a conductor moving through a magnetic field. Illustrate with a diagram. 5 A 1
- (b) Describe the structure and function of a capacitor. Explain how capacitors behave when connected in series and in parallel, and derive the equivalent capacitance for both configurations. 5 U 3
- (c) Explain hysteresis and eddy current losses in magnetic materials. How can these losses be minimized in practical applications? 5 U 2

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