Enrolment No/Seat No.: _____

R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT

(An Autonomous Institute U/s UGC Act 1956)

B.Tech. SEMESTER-I, SEMESTER END EXAMINATION – WINTER 2025

SUBJECT CODE: 2EL101 **DATE: 22-12-2025**

SUBJECT NAME: BASIC ELECTRICAL ENGINEERING

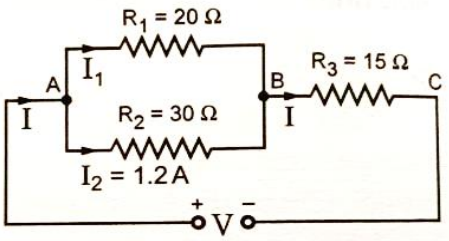
TIME: 11:00 AM to 01:30 PM **TOTAL MARKS: 70**

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 - Cognitive Level (As per Revised Bloom's Taxonomy) (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

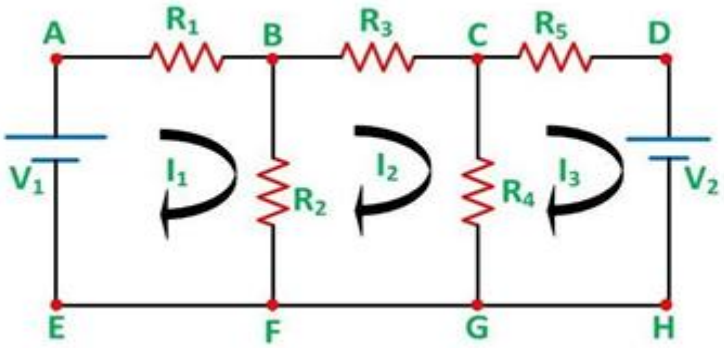
SECTION A

			Marks	BL	CO
Q.1	**(a)**	Three capacitors of 2 μF, 3 μF, and 6 μF are connected in series, find the equivalent capacitance. And The same capacitors are connected in parallel. Calculate the total capacitance.	**03**	**R**	**3**
	(b)	Explain Coulomb's Law with its mathematical expression.	**04**	**U**	**3**
Q.2	**(a)**	Explain following terms: 1) Electromotive Force (EMF) 2) Electric Current 3) Power	**03**	**U**	**1**
	(b)	Explain Kirchhoff's Current and Kirchhoff's Voltage Law.	**04**	**U**	**1**
	(c)	A circuit is consist of two parallel resistors having resistances of 20Ω and 30Ω respectively connected in series with 15Ω resistor. If current through 30Ω resistor is 1.2A, find (i) current in 20Ω and 15Ω resistors (ii) the voltage across the whole circuit (iii) voltage across 15Ω resistor and 20Ω resistor (iv) total power consumed in circuit.	**07**	**R**	**1**



OR

Q.2	**(a)**	Explain Ohm's Law and its Limitations.	**03**	**U**	**1**
	(b)	Explain how resistances combine in series and parallel circuits and derive the equivalent resistance for them.	**04**	**U**	**1**
	(c)	Find current flowing through 6 Ω resistor of the following figure using mesh analysis. (V1 = 10 V, V2 = 20 V, R1 = 2 Ω, R2 = 4 Ω, R3 = 1 Ω, R4 = 6 Ω, R5 = 4 Ω)	**07**	**R**	**1**



Q.3	**(a)**	Explain Fleming's Right-Hand Rule.	**03**	**U**	**2**
	(b)	Explain Faraday's laws.	**04**	**U**	**2**
	(c)	Define magnetic reluctance, flux, and permeability. Compare magnetic circuits with electric circuits.	**07**	**R**	**2**

OR

Q.3	**(a)**	Explain Fleming's Left-Hand Rule.	**03**	**U**	**2**
	(b)	Explain Lenz's laws.	**04**	**U**	**2**
	(c)	Define eddy currents and describe the methods used to reduce eddy current losses in transformers.	**07**	**R**	**2**

SECTION B

			Marks	BL	CO
Q.4	**(a)**	What is earthing? Discuss the purpose of earthing.	**03**	**R**	**6**
	(b)	Explain working of ELCB and MCB.	**04**	**R**	**6**
Q.5	**(a)**	Define following terms in connection with AC waveforms. (1) R.M.S value (2) Average value (3) Form Factor	**03**	**U**	**4**
	(b)	A coil taken 2.5 A, when connected across 200 V, 50 Hz main. The power consumed by the coil is found to be 400 W. Calculate resistance, impedance and inductance of the coil. Also find power factor of the circuit.	**04**	**N**	**4**
	(c)	Analyze the phenomena of R-L-C series AC circuit with help of equation and graph.	**07**	**A**	**4**
		OR			
Q.5	**(a)**	Define the following for AC circuit. (1) Apparent power (2) Active power (3) Power factor	**03**	**U**	**4**
	(b)	A capacitor of 35μF is connected in series with a variable resistor. It is connected across 230 V, 50 Hz mains. Find the value of the resistor for a condition when the voltage across capacitor is half the supply voltage, also calculate, (1) current drawn (2) power factor and (3) power of the said conditions.	**04**	**N**	**4**
	(c)	Prove the condition of resonance for R-L-C series AC circuit. Also analyze the phenomena with help of phasor diagram and sketch the resonance curve.	**07**	**A**	**4**
Q.6	**(a)**	Explain in brief the necessity and advantage of three phase system.	**03**	**R**	**5**
	(b)	A delta connected load having branch impedances of (15+j 20) **Ω** is connected to a 220 V, 3- phase AC supply. Find (1) Line currents (2) per phase power consumed (3) What is the phasor sum of the line currents? Why does it have this value?	**04**	**E**	**5**
	(c)	Derive the voltage and current relationship in star connected load.	**07**	**U**	**5**
		OR			
Q.6	**(a)**	Explain in brief the following for 3-phase AC circuit: Phase sequence.	**03**	**R**	**5**

(b)	A balanced star connected load of (4+j 3) Ω per phase is connected to a balanced 3- phase 400 V supply. Find the line current, power factor, active power and reactive power.	**04**	**E**	**5**
(c)	Derive the voltage and current relationship in delta connected load.	**07**	**U**	**5**

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