# 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: 2EL104**  **DATE: 22-12-2025**
**SUBJECT NAME: FUNDAMENTAL OF ELECTRICAL &**
**ELECTRONICS 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.
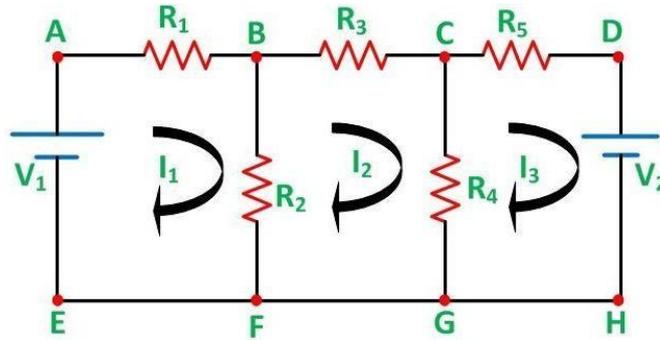
## SECTION A

| | | | Marks | BL | CO |
|---|---|---|---|---|---|
| **Q.1** | **(a)** | Write down the difference between Conductors, semiconductors and Insulators. | **03** | **R** | **3** |
| | **(b)** | Explain Float zone process for crystal growth in detail | **04** | **U** | **3** |
| **Q.2** | **(a)** | State and explain ohm's law & its limitation | **03** | **R** | **1** |
| | **(b)** | Discuss the working of a Lead Acid Battery. | **04** | **R** | **1** |
| | **(c)** | Calculate the electricity bill amount for a month of April, if 4fans of 60 W for5 h, 4 tube lights of 40 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. | **07** | **A** | **1** |

### OR

| | | | Marks | BL | CO |
|---|---|---|---|---|---|
| **Q.2** | **(a)** | State and explain Kirchhoff's voltage and current laws. | **03** | **R** | **1** |
| | **(b)** | State & explain superposition theorem with example. | **04** | **R** | **1** |

**(c)** Find current flowing through 6 Ω resistor of the following figure using mesh analysis. ($V_1$ = 10 V, $V_2$ = 20 V, $R_1$ = 2 Ω, $R_2$ = 4 Ω, $R_3$ = 1 Ω, $R_4$ = 6 Ω, $R_5$ = 4 Ω)     **07     A     1**



**Q.3**  **(a)**  Prove that average power consumed by the inductor is zero.     **03     U     2**

**(b)**  Define following terms in connection with A.C wave forms:     **04     R     2**
(i) Frequency (ii) R. M. S. Value (iii) Q factor. (iv) Form Factor

**(c)**  What is earthing? Draw and explain the pipe earthing.     **07     U     2**

**OR**

**Q.3**  **(a)**  Draw only phasor diagram of voltage and current in pure inductive circuit     **03     U     2**

**(b)**  Draw power triangle and define active power, reactive power and apparent power.     **04     R     2**

**(c)**  With neat diagram explain the working of miniature circuit breaker (MCB).     **07     U     2**

# SECTION B

| | | | Marks | BL | CO |
|---|---|---|---|---|---|
| **Q.4** | **(a)** | Explain working of LED. | 03 | U | 5 |
| | **(b)** | Describe forward and reverse biasing of PN Junction with proper diagram. | 04 | R | 5 |
| | | | | | |
| **Q.5** | **(a)** | Write a short note on Fermi level. | 03 | R | 4 |
| | **(b)** | At what temperature we can expect 20% probability the electrons in a metal can have which is lying 1% above its Fermi level? Fermi energy of the given metal is 5.5 eV. | 04 | A | 4 |
| | **(c)** | Derive the formula for the concentration of electrons in the conduction band. | 07 | A | 4 |

**OR**

| | | | Marks | BL | CO |
|---|---|---|---|---|---|
| **Q.5** | **(a)** | Write a short note on carrier transport mechanism. | 03 | R | 4 |
| | **(b)** | Consider an energy level lying 0.01 eV above Fermi level. What is the probability of this level not being occupied by an electron at 300 K? | 04 | A | 4 |
| | **(c)** | Derive formula for conductivity of conductors and semiconductors on the basis of band theory of solids. | 07 | A | 4 |
| | | | | | |
| **Q.6** | **(a)** | Explain construction of NPN Bipolar junction transistor. | 03 | U | 6 |
| | **(b)** | Explain n-channel FET. | 04 | U | 6 |
| | **(c)** | Explain Principle, construction and working of Solar cell with its advantages and disadvantages. | 07 | U | 6 |

**OR**

| | | | Marks | BL | CO |
|---|---|---|---|---|---|
| **Q.6** | **(a)** | List out applications of BJT. | 03 | U | 6 |
| | **(b)** | Explain photovoltaic effect. | 04 | U | 6 |
| | **(c)** | Explain Principle, construction and working of MOSFET. | 07 | U | 6 |

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