

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)

CLASS: IMSc  
BRANCH: PHYSICS

SEMESTER: III  
SESSION: MO/2025

SUBJECT: SEC24203 - ELECTRICAL CIRCUITS AND NETWORK SKILLS

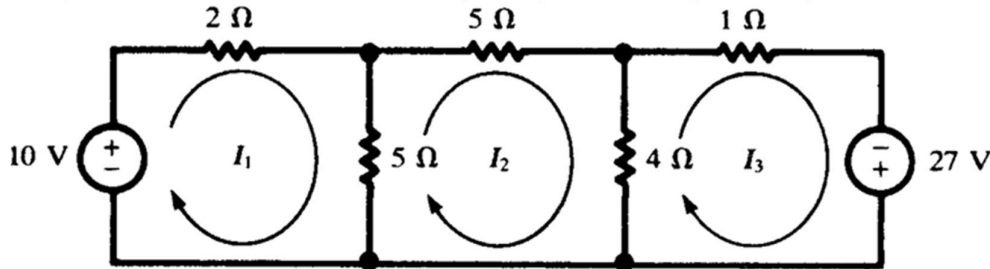
TIME: 3 Hours

FULL MARKS: 50

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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|---|-----|-----|
| Q.1(a) What are the characteristics of an (i) ideal voltage source, (ii) ideal current source, (iii) ideal voltmeter, and (iv) ideal ammeter.   | [4] | 1 1 |
| Q.1(b) Find the currents $I_1$ , $I_2$ and $I_3$ in the given network using Kirchoff's current and voltage laws. (Note the direction of currents and polarity of the voltage sources) | [6] | 1 3 |



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| Q.2(a) A $100\ \Omega$ resistor, $20\ \mu\text{F}$ capacitor and a $2\ \text{H}$ inductor are connected in series. Find the frequency at which power factor of the circuit will become half.  | [5] | 1 2 |
| Q.2(b) Draw the symbols of (i) SPST relay, (ii) iron core inductor, and (iii) trimmer resistor. What is the difference between a variable resistance and a trimmer resistor.  | [5] | 2 2 |
| Q.3(a) Draw the circuit of an unregulated DC power supply utilizing a bridge rectifier and a capacitor filter. Sketch the output waveform of this supply and comment whether the ripple factor is dependent on or independent of load resistance? | [5] | 3 2 |
| Q.3(b) Explain the working principle and any two applications of transformers.  | [5] | 3 2 |
| Q.4(a) Explain the causes of power loss in transformers and discuss how these losses can be minimized.  | [5] | 3 2 |
| Q.4(b) What is <i>ground-fault</i> ? Explain how ground-fault can be detected.  | [5] | 4 2 |
| Q.5(a) Briefly explain where the following are commonly used: (i) twisted-pair electrical wires, (ii) stranded-core wires, (iii) solid-core co-axial cables.  | [5] | 5 2 |
| Q.5(b) Explain the working of a moving coil galvanometer and how a galvanometer can be converted into a voltmeter.  | [5] | 5 3 |