
Indian Maritime University
(A Central University, Govt of India)

Mar/Apr '26 SE

Programme Name: B Tech (ME)

Semester: I

Subject Code: UG11T5105

Subject Name: BASIC ELECTRICAL TECHNOLOGY

Date: 09.03.2026

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective sections.
- (iii) Use of programmable calculators is not permitted. Only non programmable scientific calculators are permitted

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. Kirchhoff's current law is applicable to only

- a) closed loops in a network b) electronic circuits c) junctions in a network d) electric circuits

2. The algebraic sign of an IR drop is primarily dependent upon the

- a) amount of current flowing through it b) value of R c) direction of current flow d) battery polarity

3. Unit of magnetic flux is

- a) weber b) ampere-turn c) tesla d) coulomb
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4. _____ is defined as the property of a material which opposes the creation of magnetic flux in it.

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5. The voltage applied across an R-L circuit is equal to _____ of V_R and V_L

- a) arithmetic sum b) sum of the squares c) algebraic sum d) phasor sum

6. An R-L circuit has $Z = (6 + j8)$ ohm. Its susceptance is _____ Ω

- a) 0.1666 b) ~~0.125~~ c) -0.08 d) ~~0.06~~

7. In a balanced star connected system, the relationship between V_L and V_{ph} is

- a) $V_L = \sqrt{3}V_{ph}$ with V_L lagging V_{ph} by 30° b) $V_{ph} = \sqrt{3}V_L$ with V_L lagging V_{ph} by 30° c) $V_L = \sqrt{3}V_{ph}$ with V_L lead V_{ph} by 30° d) $V_{ph} = \sqrt{3}V_L$ with V_L lead V_{ph} by 30°

8. The minimum number of wattmeter(s) required to measure 3-phase, 3-wire unbalanced power is

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- a) 1 b) 2 c) 3 d) 4

9. Which of the following control mechanism(s) are affected by the orientation of placement with respect to ground?

- a) Spring control b) Gravity control c) Both (a) and (b) d) None of the above

10. The _____ mechanism in a measuring instrument is responsible for moving the pointer or needle from the zero or reference position when a measurement is taken.

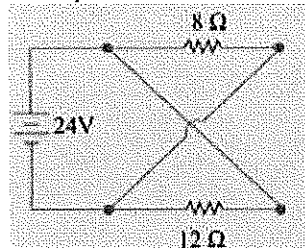
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Section B

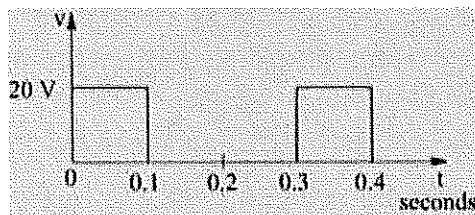
Five Questions of 02 Marks each

11. What is the current supplied by the source in the below figure



12. What is the Ohms Law equivalent for magnetic circuits? Write the same with correct units

13. Compute the average and RMS value of the square voltage wave shown in figure below



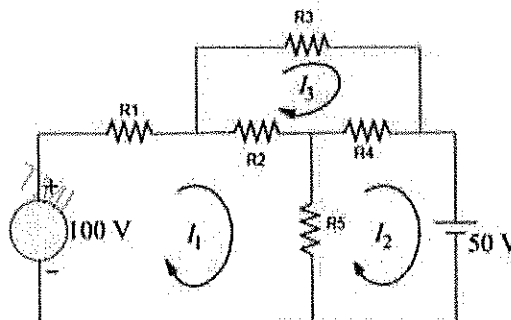
14. Write the equations between line and phase currents for an unbalanced delta connected load.

15. What is the use of damping mechanisms in measuring meters? List 2 types of damping mechanisms.

Section C

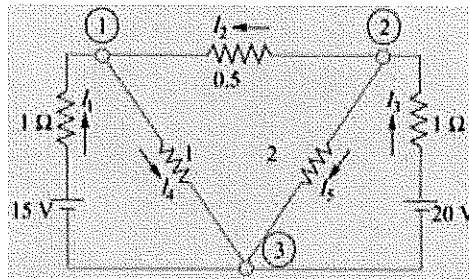
Seven Questions of 10 Marks each of which any 05 questions to be answered.

16.a. Find loop currents I_1 , I_2 and I_3 using mesh analysis for the circuit of figure below



(5 marks)

16.b. Solve the following network for the nodal voltages and loop currents using nodal analysis.



(5 marks)

17.a) Two coils having 30 and 600 turns respectively are wound side-by-side on a closed iron circuit of area of cross-section 100 sq.cm. and mean length 200 cm. Estimate the mutual inductance between the coils if the relative permeability of the iron is 2000. If a current of zero ampere grows to 20 A in a time of 0.02 second in the first coil, find the e.m.f. induced in the second coil.

(5 marks)

17. b) Two coils, A of 12,500 turns and B of 16,000 turns, lie in parallel planes so that 60 % of flux produced in A links coil B. It is found that a current of 5A in A produces a flux of 0.6 mWb while the same current in B produces 0.8 mWb. Determine (i) mutual inductance and (ii) coupling coefficient

(5 marks)

18.a. A resistance of 20 Ω, an inductance of 0.2 H and a capacitance of 100 μF are connected in series across 220-V, 50-Hz mains. Determine the following (a) impedance (b) current (c) voltage across R, L and C (d) Watta, VAR and VA (e) p.f. and angle of lag.

(6 marks)

18.b. A 15-mH inductor is in series with a parallel combination of an 80 Ω resistor and 20 μF capacitor. If the angular frequency of the applied voltage is $\omega = 1000$ rad/s, find the admittance of the network.

(4 marks)

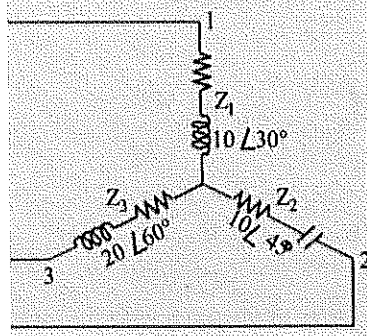
19. Three similar coils, each having a resistance of 20 ohms and an inductance of 0.05 H are connected in (i) star and (ii) delta to a 3-phase, 50-Hz supply with 400-V between lines. For each case, calculate the line current and total Volt-Amps(VA). From the results, infer how the power varies between the two types of connections.

20. With a neat diagram, derive and explain the relationship between deflection and meter current for

- i. MI instrument
- ii. MC instrument

(5+5 marks)

21. a) Derive the equations for $\Delta \rightarrow Y$ conversion and $Y \rightarrow \Delta$. Using the above equations
21.b) Find the equivalent Δ values of the following Y network



(7+3 marks)

22. Explain the methods of measuring power in three-phase circuits, using the three-wattmeter method and two-wattmeter method.

(5+5 marks)

