

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

**End Semester Examinations – December 2025**

**Programme Name: B Tech (ME)**

**Semester: I**

**Subject Code: UG11T5105**

**Subject Name: Basic Electrical Technology**

---

Date: 16.12.2025

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 section.
- (iii) Only non-programmable scientific calculators are allowed.

**Section A**

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

1. An ideal voltage source is defined as a source that:
  - a. Supplies constant current irrespective of the load resistance
  - b. Supplies constant voltage irrespective of the load resistance
  - c. Supplies variable voltage depending on the load
  - d. Has internal resistance equal to the load resistance
2. The resistance of a conductor of diameter  $d$  and length  $l$  is  $R \Omega$ . If the diameter of the conductor is halved and its length is doubled, the resistance will be?
  - a)  $R$
  - b)  $2R$
  - c)  $4R$
  - d)  $8R$
3. The slope of B-H curve at any point represents:
  - a. Retentivity
  - b. Coercivity
  - c. Susceptance
  - d. Permeability
4. In a series RLC circuit, for frequency lower and higher than resonance frequency, power factors are respectively \_\_\_\_\_
  - a) Leading, Lagging
  - b) Lagging, Leading
  - c) Independent of Frequency
  - d) Same in both cases

---

5. The ratio of form factor to peak factor for a single-phase sinusoidal AC waveform is approximately:

- a. 0.637                      b. 0.707                      c. 1.11                      d. 0.785

6. A ring having a cross-sectional area of  $500 \text{ mm}^2$ , a circumference of 400 mm and  $\phi = 800 \mu\text{Wb}$  has a coil of 200 turns wound around it. Calculate the flux density of the ring.

- a) 1.6T    b) 2.6T  
c) 3.6T    d) 4.6T

7. A three-phase balanced delta connected load of  $(4+j8) \Omega$  is connected across a 400V, 3 -  $\phi$  balanced supply. Determine the phase current IR.

- a)  $44.72 \angle 183.4^\circ \text{A}$     b)  $25.81 \angle -63.4^\circ \text{A}$   
c)  $44.72 \angle -63.4^\circ \text{A}$     d)  $45.74 \angle -183.4^\circ \text{A}$

8. A three-phase supply is said to be balanced when:

- a. All three phase voltages are equal in magnitude and  $120^\circ$  apart in phase  
b. All three phase voltages are equal in magnitude but have unequal phase differences  
c. The line voltages are unequal, but the phase voltages are equal  
d. The sum of the three phase voltages at any instant is zero

9. Which of the following statements about moving coil (MC) and moving iron (MI) instruments is correct?

- a. Moving coil instruments can measure both AC and DC, while moving iron instruments measure only DC.  
b. Moving coil instruments are used for accurate DC measurements, while moving iron instruments are suitable for both AC and DC measurements.  
c. Moving iron instruments have a uniform scale, while moving coil instruments have a non-linear scale.  
d. Moving coil instruments consume less power than moving iron instruments.

10. Creeping in energy meter can avoided by \_\_\_\_\_

- a) reversing the polarity of the voltage  
b) drilling two diametrically opposite holes  
c) holding the disc  
d) increasing the friction

### **Section B**

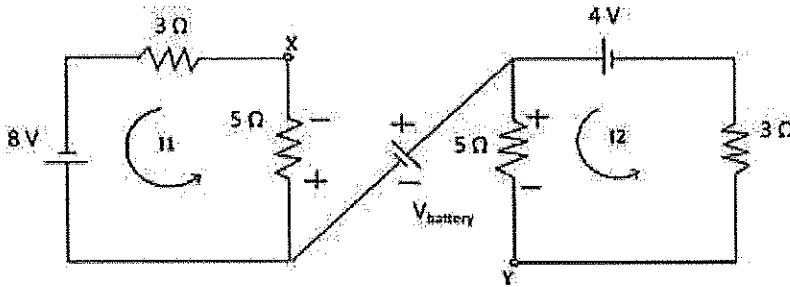
Five Questions of 02 Marks each

11. In the measurement of three-phase power using the two-wattmeter method, if the two wattmeter readings are equal, what is the power factor of the load?

---

12. Compute the mutual inductance for a given pair of coils if increase in current from 2 A to 4 A in 0.1 s in one coil causes an induced e.m.f. of 2 V in the other coil.

13. Find the value of  $V_{\text{battery}}$  if  $V_{xy}$  is 5 V, for the given circuit.



14. Define active, reactive and apparent power.

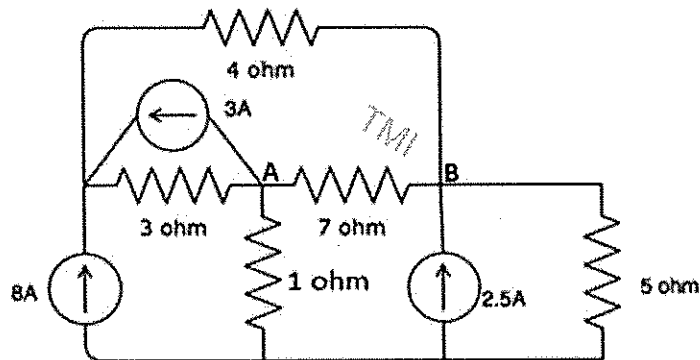
15. A current given by  $i = 5 + 14.14 \sin(314t + 45^\circ)$  is applied to both a center-zero PMMC instrument and a moving-iron instrument. Determine the readings indicated by each instrument.

### Section C

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

16. Calculate the voltages at node A and B?

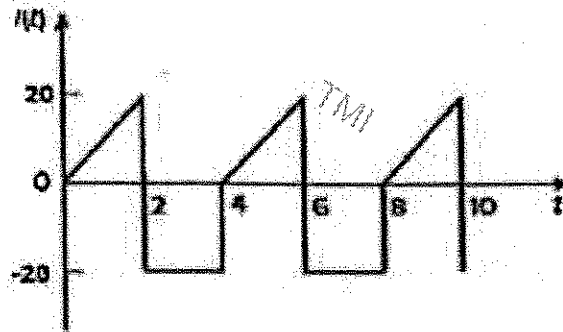
(10 Marks)



17. (a) Calculate the mmf required to produce a flux of  $0.015 \text{ Wb/m}^2$  across an airgap 2.5mm long, having an effective area of  $200\text{cm}^2$ . (4 Marks)

17. (b) A coil of 500 turns is wound uniformly over a wooden ring having a mean circumference of 600mm and a uniform cross-sectional area of  $500\text{mm}^2$ . If the current through the coil is 10A, calculate the magnetic field strength, the flux density and the core flux. (6 Marks)

18. Calculate the power dissipated in a resistance of  $10\Omega$ . The waveform profile of current flowing through the resistance is shown in the figure having a peak value of 20A. (10 marks)



19. (a) Phase voltages of a star-connected alternator are  $E_R = 231\angle 0^\circ\text{V}$ ;  $E_Y = 231\angle -120^\circ\text{V}$  and  $E_B = 231\angle +120^\circ\text{V}$ . What is the phase sequence of the system? Compute the line voltages  $E_{RY}$  &  $E_{YB}$ . (4 Marks)

19. (b) Three Coils, each having a resistance of  $20\ \Omega$  and an inductive reactance of  $15\ \Omega$ , are connected in star to a  $400\text{V}$ , 3-phase,  $50\ \text{Hz}$  supply. Calculate (i) the line current, (ii) power factor and (iii) real, reactive and apparent power supplied. (6 Marks)

20. (a) The power input to a  $2000\text{V}$ ,  $50\text{Hz}$ , 3-phase motor running on full-load at an efficiency of  $90\%$  is measured by two watt-meters which indicate  $300\ \text{kW}$  and  $100\ \text{kW}$  respectively. Assuming both the meters are showing positive values, find (i) the input power (ii) the power factor (iii) line current and motor output power (6 Marks)

20. (b) Three similar coils each having a resistance of  $5\ \Omega$  and inductance of  $0.02\ \text{H}$  are connected in delta, to a  $440\ \text{V}$ , 3-phase,  $50\ \text{Hz}$  supply. Calculate the line current. (4 Marks)

21. a) Write short note on Faraday's law of Electromagnetic Induction and Lenz's Law (4 marks)

b) Derive an expression for the force exerted on a current-carrying conductor situated in a magnetic field. (6 marks)

22. (a) Describe the essential torques required for the proper working of an indicating instrument, with their purpose and method of production. (6 Marks)

22. (b) Find the Root Mean Square value of the current waveform shown in the figure. (4 Marks)

