Indian Maritime University

(A Central University, Govt of India)

Supplementary Examinations – March/April 2025

Programme Name: B Tech (ME)

Semester: I

Subject Code: UG11T5105

Subject Name: BASIC ELECTRICAL TECHNOLOGY

Date: 07.03.2025 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 can be used for solving the problems

Section A

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

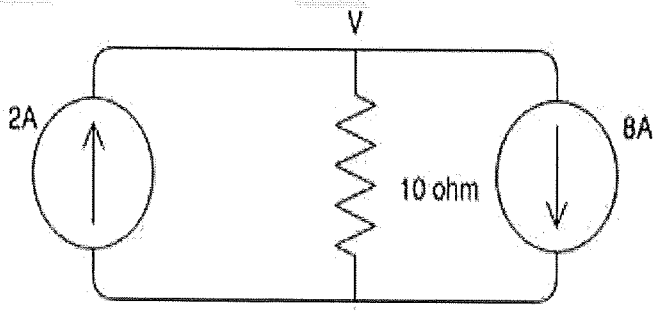
1. Kirchhoff's current law is applicable to only			
a) closed loops in a network	b) electronic circuits	c) junctions in a network	d) electric circuits
2. Relative permeability of vacuum is			
a) $4\pi \times 10^{-7}$ H/m	b) 1 H/m	c)1	d) 1/4 π
3. If load draws a current of 10 A at 0.8 p.f., when connected to 100V supply. The value of real and reactive power will be			
a) 800W, 600VAR	b) 600W, 800 VAR	c) 60W, 600 VAR	d) 800W, 80 VAR
4. In a 3 Phase supply system, the 3 supply voltages are phase shifted from each other by _____ rads.			
a) $\pi/2$	b) π	c)2 π	d)2 $\pi/3$
5. The minimum number of wattmeters required for measurement of 3 phase power is			
a)1	b)2	c)3	d)4
6. KVL deals with the conservation of?			

a) Mass	b) Momentum	c) Charge	d) Energy
7 The moving system of an indicating type of electrical instrument is subjected to			
a) a deflecting torque	b) a controlling torque	c) a damping torque	d) all of the above
8) The magnetic flux through a coil having a single turn is varying according to the relation: $\phi = (25t3 + 10t2 + 5t - 5)$ Wb. Determine the impedance of the coil (in ohm) If the induced current through the coil is 10 A at t = 1 sec?			
a) 50	b) 10	c) 100	d) None of the above
9) _____ the resonant frequency, the current in the inductor lags the voltage in a series RLC circuit.			
a) Above	b) Below	c) Equal to	d) Depends on the circuit
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. Find the value of the node voltage V for the circuit given below.



12. A conductor of length 1 metre moves at right angles to a uniform magnetic field of flux density 1.5 Wb/m2 with a velocity of 50 metre/second. Calculate the e.m.f. induced in it, when the conductor moves at an angle of 30º to the direction of the field.

13. In an alternating circuit, the impressed voltage is given by V = (100 – j50) volts and the current in the circuit is I = (3 – j4) A. Determine the real and reactive power in the circuit

14. In a 4-wire, 3-phase system, two phases have currents of 10A and 6A at lagging power factors of 0.8 and 0.6 respectively while the third phase is open-circuited, Calculate the current in the neutral

15. What is damping torque in instruments?

Section C

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

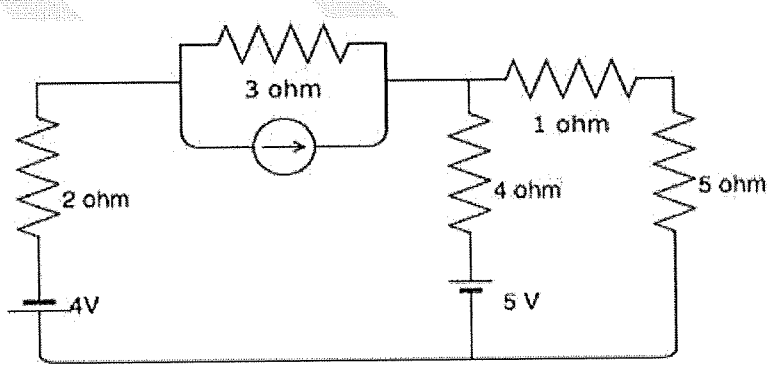
16. (a) A series R-L-C circuit is connected to a 25 V source of variable frequency. The circuit current is found to be a maximum of 0.5 A at a frequency of 400 Hz and the voltage across C is 150 V. Assuming ideal components, then what will the values of R and L?

(5 Marks)

(b) The self-inductance of a choke coil is 10 m H. When it is connected with a 10 V DC source, then the loss of power is 20 watt. When it is connected with 10 volt AC source loss of power is 10 watt. Calculate the frequency of AC source used here?

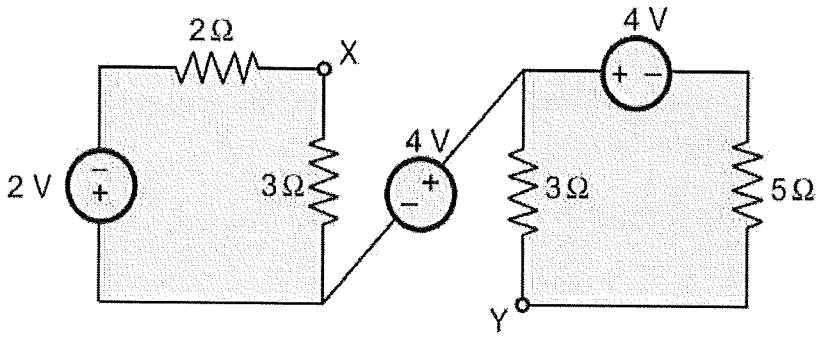
(5 Marks)

17. What is the voltage across the 5 ohm resistor if current source has current of 17/3 A? (10 Marks)



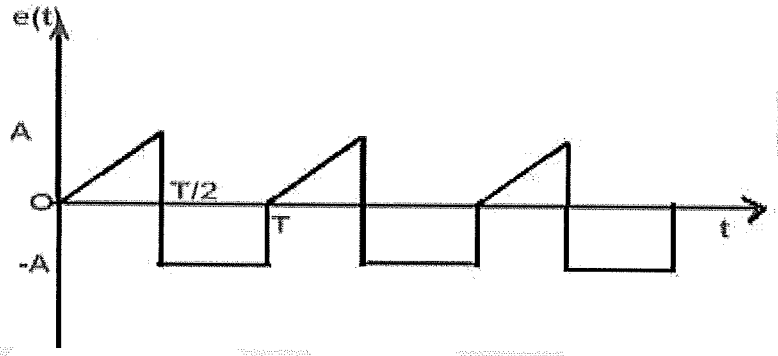
18. Find the Potential Difference between X and Y shown in the network.

(10 Marks)



19. Calculate the power dissipated in a resistance of 10Ω. The waveform profile of current flowing through the resistance is shown in the figure having a peak value A=10.

(10 marks)



20. An unbalanced star-connected load has branch impedances of $Z_1 = 10 \angle 30°$ Ω , $Z_2 = 10 \angle -45°$ Ω , $Z_3 = 20 \angle 60°$ Ω and is connected across a balanced 3-phase, 3-wire supply of 200 V. Find the line currents and the voltage across each impedance using Y / Δ conversion method. (10 marks)

21. With a neat diagram, explain the construction and working of Dynamometer type Wattmeter. (10 marks)

22. (a) Three loads, each of resistance 30, are connected in star to a 415 V, 3-phase supply. Determine

(i) the system phase voltage,
(ii) the phase current
(iii) the line current (2+1+1=4 marks)

(b) Derive the formula for power factor calculation in case of two wattmeter method. What are the major limitations of two Wattmeter method.

(5+1=6 Marks)