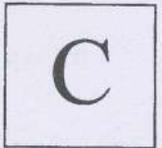# B.Tech. Degree I Semester Regular/Supplementary Examination in Marine Engineering November 2022

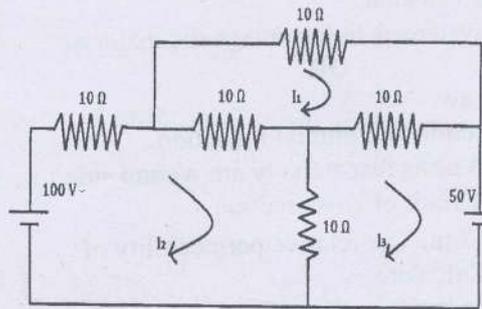### 19-208-0105 BASIC ELECTRICAL ENGINEERING
(2019 *Scheme*)

Time: 3 Hours

Maximum Marks: 60

Course Outcome
On successful completion of the course, the students will be able to:

CO1: Acquire knowledge of electrical circuit analysis.
CO2: Review the basic concepts of magnetic circuits, electromagnetism & electrostatics.
CO3: Understand AC generation, representation & analysis of AC circuits.
CO4: Grasp the methods of Electrical power generation and concept of three phase system.
CO5: To understand Electrical power transmission, distribution, house wiring.
Bloom's Taxonomy Levels (BL): L1 – Remember, L2 – Understand, L3 – Apply, L4 –Analyze, L5 – Evaluate, L6 – Create
PO – Programme Outcome

			(5 × 15 = 75)	Marks	BL	CO	PO
I.	(a)	Explain Kirchhoff's voltage and current law.		5	L2	1	1.3.1
	(b)	Find mesh currents in the figure shown by mesh analysis. Apply Cramer's rule.		10	L5	1	2.2.2

OR

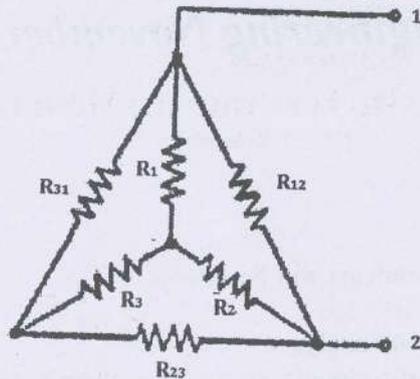| II.	(a)	Find the voltage across 2Ω resistor using superposition theorem.	6	L5	1	2.2.2
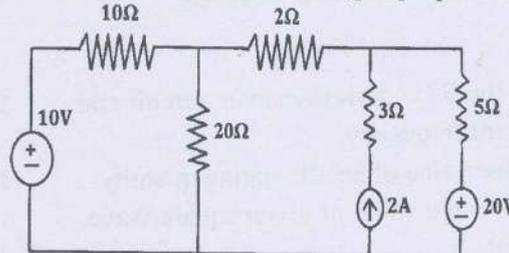
|	(b)	Using Thevenin's theorem, calculate the current flowing through 5 Ω resistor in the following circuit.	4	L5	1	2.2.2

(P.T.O.)

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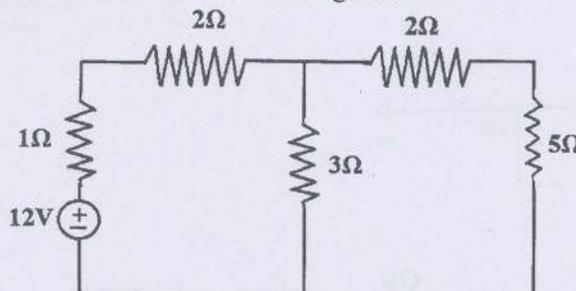
		Marks	BL	CO	PO

(c) Find the equivalent resistance between terminals 1 and 2, for the given circuit. Take R1=R2=R3=3Ω and R12=R23=R31=5Ω.   5   L5   1   2.2.2

III. (a) State and explain Coulomb's law in electrostatics.   3   L1   2   1.3.1

(b) A steel ring of circular section 1cm in radius and having a mean circumference of 94.3 cm has an air gap of 1mm length. It is uniformly wound with 1000 turns of wire carrying a current of 2.5A. Calculate: 8   L3   2   2.2.2
  (i) MMF
  (ii) Reluctance
  (iii) Magnetic flux
  (iv) Magnetic flux density in air gap
  (v) Relative permeability of steel ring. Assume that steel path takes about 40% of the total mmf.

(c) Explain the phenomenon of hysteresis in ferromagnetic material.   4   L2   2   1.3.1

OR

IV. (a) State and explain Faraday's Law.   4   L1   2   1.3.1

(b) Distinguish between self induction and mutual induction.   5   L2   2   1.3.1

(c) Two coils having 150 and 200 turns respectively are wound side by side on a closed magnetic circuit of cross section $1.5 \times 10^{-2} m^2$ and mean length 3 m. The relative permeability of the magnetic circuit is 2000. Calculate: 6   L3   2   2.2.2
  (i) The mutual inductance between the coils
  (ii) The voltage induced in the second coil if the current changes from 0 to 10A in the first coil in 20 ms.

V. (a) What is resonance? Explain the RLC series resonant circuit and derive the equation for resonant frequency.   5   L2   3   1.3.1

(b) Define RMS value and average value of an alternating quantity.   4   L2   3   1.3.1

(c) Determine RMS value and average value of given square wave. Also find its peak and form factor.   6   L3   3   2.2.2

OR
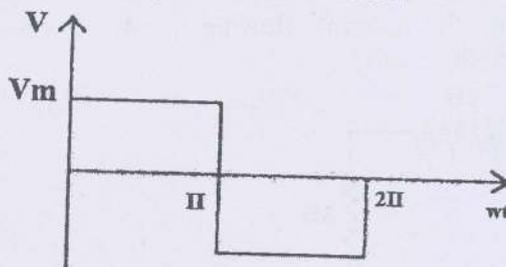
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			Marks	BL	CO	PO
VI.	(a)	Prove that average power for a purely capacitive circuit is zero.	5	L4	3	1.3.1
	(b)	A series circuit having R = 100 Ω, L = 0.12H and C = 28.27μF is fed from 100 V, 50Hz supply. Find the current, active power, impedance, rms values of voltage across resistor, inductor and capacitor.	10	L5	3	2.2.2
VII.	(a)	Three impedances, each having resistance 20 Ω and inductive reactance of 15 Ω are connected in star connection across a 400V, three phase supply. Calculate: (i) The line current (ii) The power factor (iii) Total power in the circuit	6	L5	4	2.2.2
	(b)	Derive the relationship between line current and phase current in a three phase delta connected system with the help of vector diagram.	9	L2	4	1.3.1

OR

			Marks	BL	CO	PO
VIII.	(a)	What factors are taken into account while selecting the site for thermal power plant? Also discuss the merits and demerits of thermal electric power plant.	5	L2	4	1.3.1
	(b)	Draw a neat schematic diagram of a hydro-electric power plant and explain the functions of various components. Also list four advantages and disadvantages.	10	L2	4	1.3.1
IX.	(a)	With the help of a diagram, explain the power transmission and distribution scheme.	9	L2	5	1.3.1
	(b)	Compare AC and DC transmission.	6	L2	5	1.3.1

OR

			Marks	BL	CO	PO
X.	(a)	What is the purpose of earthing? Explain plate earthing in detail.	7	L2	5	1.3.1
	(b)	List out the important safety precautions that must be observed when working with electrical appliances.	8	L2	5	1.3.1

Bloom's Taxonomy Levels
L1 = 4.6%, L2 = 51.3%, L3 = 13.3%, L4 = 3.3%, L5 = 27.3%

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