BT MRE-I(R/S)-11-23-3004 Reg. No. | | | | | | | | |

B

B.Tech. Degree I Semester Regular/Supplementary Examination in Marine Engineering November 2023

19-208-0105 BASIC ELECTRICAL ENGINEERING

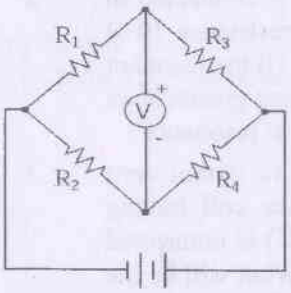
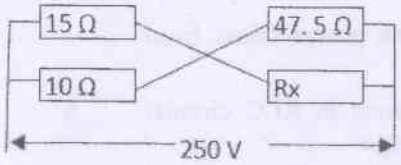
(*2019 Scheme*)

Time: 3 Hours Maximum Marks: 60

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

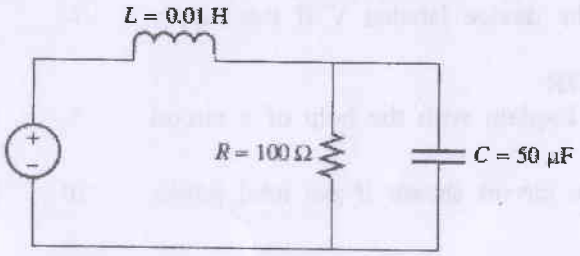
CO1: Acquire knowledge of electrical circuit analysis.
CO2: Review the basic concepts of magnetic circuits, electromagnetism and electrostatics.
CO3: Understand AC generation, representation and analysis of AC circuits.
CO4: Grasp the methods of Electrical power generation and concept of three phase 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
PI – Programme Indicators

Answer *ALL* questions (5 × 15 = 75)

			Marks	BL	CO	PI
I.	(a)	How does temperature influence the resistance of a conducting material like copper? Give the relationship between temperature and resistivity.	5	L2	1	1.1.1
	(b)	Refer the diagram below:  A set of four resistive strain gauges are connected as shown with R1 = 23.1 kΩ, R2 = 18.9 kΩ, R3 = 18.9 kΩ and R4 = 23.1 kΩ. Voltage is 12 V dc. What will be the power dissipated by a 20.8 kΩ resistor connected in place of the device labeled V if the supply voltage is 12V dc?	10	L3	1	2.3.1
		OR				
II.	(a)	What is superposition theorem? Explain with the help of a circuit diagram.	5	L2	1	1.1.1
	(b)	Calculate the value of Rx in the circuit shown if the total power dissipated in the circuit is 2500 W. 	10	L4	1	2.3.1

(P.T.O.)

			Marks	BL	CO	PI
III.	(a)	Give the equation for stored energy in a capacitor. How can you increase the stored energy in a capacitor?	3	L2	2	1.2.1
	(b)	Explain magnetic hysteresis with the help of relevant graph. Which will exhibit more hysteresis – soft iron or transformer steel?	5	L3	2	1.3.1
	(c)	A closed magnetic circuit of cast steel contains an 8 cm long path of cross-sectional area 1 cm^2 and a 2 cm path of cross-sectional area 0.5 cm^2. A coil of 400 turns is wound around the 8 cm length of the circuit and a current of 0.2 A flows. Determine the flux density in the 2 cm path, if the relative permeability of the cast steel is 750. ($\mu_0 = 4\pi \times 10^{-7}$ H/m).	7	L2	2	2.2.3
		OR				
IV.	(a)	You want to make a parallel plate capacitor from two metal plates and some thin sheets of wax paper. For a capacitance of 50 μf, what should be the area of the metal plate if dielectric thickness is 0.1 mm? Assume relative permittivity of paper as 2.5. For the same area of plates what will be the capacitance if an air space of 0.1 mm is there between the dielectric paper and one plate? ($\varepsilon_o = 8.854 \times 10^{-12}$ F/m).	6	L5	2	1.2.1
	(b)	Two coils have a mutual inductance of 0.25 H. If the current in one coil is changed from 12 A to 2 A in 10 ms, calculate: (i) the average induced e.m.f. in the second coil (ii) the change of flux linked with the second coil if it is wound with 500 turns.	6	L4	2	2.2.3
	(c)	State and briefly explain Lenz's law.	3	L1	2	1.3.1
V.	(a)	In an ac voltage measurement your meter showed 220 V as rms value. What is the (i) maximum value (ii) average value?	4	L1	3	1.3.1
	(b)	A coil of inductance 80 mH and negligible resistance is connected in series with a capacitance of 0.25 μF and a resistor of resistance 10 Ω across a 230 V, variable frequency supply. Determine: (i) the resonant frequency (ii) the current at resonance. How many times greater than the supply voltage is the voltage across the reactance's at resonance?	8	L4	3	1.3.1
	(c)	By using a capacitor and an inductor is it possible to obtain zero impedance in the real world? Suppose an inductance coil having numerically equivalent reactance of a real capacitor (C) is connected across the terminals of the fully charged capacitor, C. What will be the state of the capacitor after a long time? Briefly explain the reasons.	3	L5	3	2.3.1
		OR				
VI.	(a)	In the circuit $v(t) = 5 \cos(500t + 60°)$	9	L4	3	1.3.1



Find the average power reactive power, reactive power taken from source and the power factor.

	(b)	Differentiate between series and parallel resonance in RLC circuits showing the appropriate plots of current and voltage.	6	L3	3	1.3.1

(Continued)

			Marks	BL	CO	PI
VII.	(a)	A coil of inductance 0.12 H and resistance 3 kΩ is connected in parallel with a 0.02 μF capacitor and is supplied at 40 V at a frequency of 5 kHz. Determine: (i) the current in the coil (ii) the current in the capacitor (iii) the power consumed.	6	L5	4	1.3.1
	(b)	Three identical coils, each of resistance 10 Ω and inductance 42 mH are connected (i) in star (ii) in delta to a 415 V, 50 Hz, 3-phase supply. Determine the total power dissipated in each case.	9	L4	4	2.1.3
		OR				
VIII.	(a)	How would you justify the use of solar PV and wind energy instead of thermal generation? What are the limitations?	5	L2	4	7.1.1
	(b)	In marine applications diesel engines have been long used as prime movers of generators. With a sketch explain the important parts in a diesel engine driven generation system for medium voltage applications.	10	L4	4	1.4.1
IX.	(a)	Which is better - a two-phase ac system or a single-phase ac system? Give reasons.	7	L5	5	2.2.4
	(b)	In transmission of ac electric power explain the role of transformers.	8	L3	5	1.3.1
		OR				
X.	(a)	Earthing is used as a safety measure in electrical circuits. What is the role of an ELCB in a circuit that is properly earthed? How does it function?	7	L5	5	2.2.4
	(b)	Describe a method of measuring earth electrode resistance for checking the earthing system.	8	L3	5	1.3.1

Bloom's Taxonomy Levels
L1 = 4.66%, L2 = 16.66%, L3 = 24.66%, L4 = 34.66%, L5 = 19.33%.

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