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EX/EE/5/T/111/2019

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) FIRST YEAR FIRST SEMESTER EXAMINATION, 2019

PRINCIPLES OF ELECTRICAL ENGINEERING - I

Time: Three hours

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part

	PART I Answer any three questions. Two marks are reserved for neat and well organized answers.	Marks
1.a)	Deduce the expression for the capacitance and insulation resistance of cable/cylindrical capacitor.	10
1.b)	It is required to hold four equal charges +Q in equilibrium at the corners of a square of 2 m side. Find the point charge that will do this if placed at the centre of the square. Given $\varepsilon_r = 1$.	6
2.a)	State and prove Gauss law. Deduce the expression for electric field due to a long straight charged conductor.	10
2.b)	A 9 μF capacitor is connected in series with two capacitors, 4 μF and 2 μF respectively, which are in parallel. Determine the capacitance of the combination. If a voltage of 20 V is maintained across the combination, determine the charge on the 9 μF capacitor and the energy stored in the 4 μF capacitor.	6
3.a)	Derive the expression for eddy current loss in a thin plate.	10
3.b)	Two coils, with terminals AB and CD respectively, are inductively coupled. The inductance measured between terminals AB is 380 μH and that between terminals CD is 640 μH. With B joined to C, the inductance measured between terminals AD is 1600 μH. Calculate: (a) the mutual inductance of the coils; and (b) the inductance between terminals AC when B is connected to D.	6
4.a)	Deduce an expression for the magnetizing force on the axis of a circular coil carrying current.	10
4.b)	Calculate the magnetic intensity at the centre of a circular coil of 20 cm diameter, having 1000 turns and carrying a current of 20 amps.	6
5.a)	An iron ring has a mean diameter of 15 cm, a cross-section of 20 cm^2 and a radial air-gap of 0.5 mm cut in it. The ring is uniformly wound with 1500 turns of insulated wire and a magnetizing current of 1 A produces a flux of 1 mWb in the gap. Neglecting the effects of magnetic leakage and fringing, calculate: (a) the reluctance of the magnetic circuit; (b) the relative permeability of iron.	8
5.b)	Give a comparative study between an electric and a magnetic circuit.	8

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BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) EXAMINATION, 2019

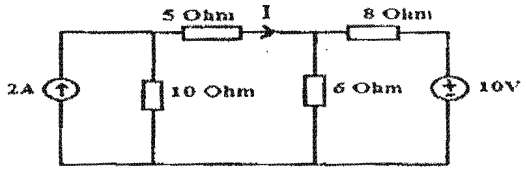
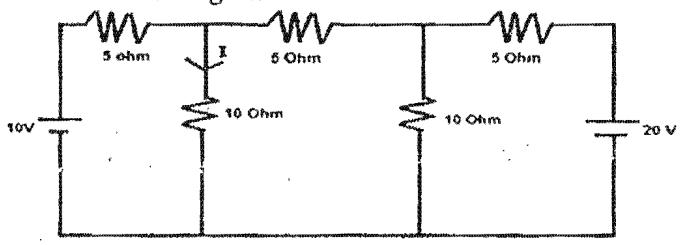
(1st Year 1st Semester)

SUBJECT : PRINCIPLES OF ELECTRICAL ENGINEERING -I

Full Marks -100

Time : Three hours (50 marks for each part)

Use a separate Answer-Script for each part

	Part II Answer any three questions. Two marks reserved for neatness and well organized answer.	Marks
1.a)	State and explain Thevnin's theorem.	2
b)	Convert a three phase delta connected resistive load to its equivalent star connected load.	4
c)	Find the value of "I" in the circuit given below. 	10
2.a)	State and explain Superposition theorem.	2
b)	State and prove Maximum power transfer theorem related to DC circuits.	2+4
c)	Find out the value of current "I" in the given circuit. 	8
3.a)	Define RMS value and average value of an alternating quantity.	2+2
b)	Define peak factor and form factor of an alternating quantity.	1+1
c)	Find out the peak factor and form factor of the following waveforms: i) Pure sinusoidal Waveform ii) Half Wave rectified sinusoidal waveform	5+5
4.a)	Draw and explain the phasor diagram for a series R-L-C circuit, in which the inductive reactance is more than capacitive reactance.	4
b)	When does resonance occurs in series R-L-C circuit? What happens to the impedance and power factor of the circuit at resonance condition?	3
c)	Define power factor. With the help of power triangle explain the concept of active power, reactive power and apparent power.	3
d)	A 110V- 60W lamp is to be operated on 220V, 50Hz supply. Calculate the value of resistance that must be connected in series to run the lamp on rated voltage. Also calculate the value of inductance that could have been used in case of resistance to run the lamp on rated voltage.	6
5. a)	Mention the units and dimensions of the following electrical quantities: i) Voltage ii) Impedance iii) Resistivity iv) Inductance	(1.5*4 = 6)
b)	A current of 5A flows through a non-inductive resistance in series with a choke coil when supplied at 250V, 50Hz. If the voltage across the resistance is 125V and voltage across the coil is 200V, calculate impedance, reactance and resistance of the coil. Also calculate the power absorbed by the coil and total power.	6
c)	A choke coil is connected in parallel to a capacitance and an AC voltage is applied across it. Draw the phasor diagram and find out the impedance for this connection.	4