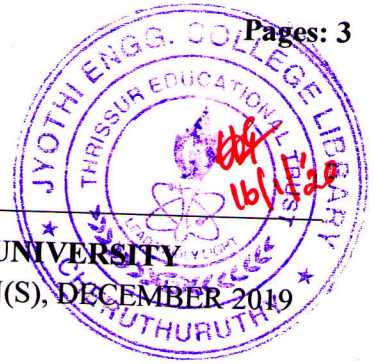D

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: BE101-03
Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100

Duration: 3 Hours

PART A
### Answer all questions, each carries 4 marks.

		Marks
1	State Faradays laws of electromagnetic induction.	(4)
2	Three resistors, 20 Ω, 90Ω and 10 Ω are connected in star. Obtain the equivalent delta circuit.	(4)
3	Distinguish between statically and dynamically induced emfs. List few electric equipments working on these principles.	(4)
4	Define mmf and reluctance.	(4)
5	A series connected load draws a current $i(t)= 4 \cos (100\pi t +10)$ A when applied across $v(t) =120 \cos (100\pi t -20)$ V. Find the value of load impedance and circuit power factor.	(4)
6	Find the form factor of a sinusoidal wave.	(4)
7	What are active and reactive powers? Draw the power triangle.	(4)
8	Define resonance in a series RLC circuit and derive the expression for resonant frequency.	(4)
9	Three identical resistors connected in delta is supplied from a three phase 400V, 50Hz supply and draws a line current of 4 A.Calculate the value of the resistors and power consumed in the resistors.	(4)
10	Derive the relationship between phase current and line current in a 3-phase delta connected system.	(4)

PART B
Answer any four full questions, each carries 10 marks.

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11	a)	Why inductors and capacitors are called energy storage devices?	(4)
	b)	An iron cored reactor is wound with 250 turns and has an air gap of 0.8 cm. The flux path in iron is 1.2 m and the cross sectional area is 0.15 m². Determine the inductance of the reactor when carrying a current of 10 A. Take relative permeability of iron as 1100.	(6)
12		Evaluate the power delivered by the 2V source in the circuit below using super mesh analysis.	(10)
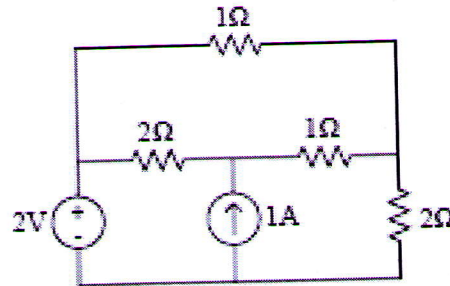
13 a) Derive an expression for dynamically induced emf in a moving conductor, placed (4) in a uniform magnetic field of flux density B Tesla.

   b) Tabulate the similarities and dissimilarities of electrical circuits and magnetic (6) circuits.

14 a) Define permeability and relative permeability. (4)

   b) A steel ring has a circular cross-section of area 20 mm^2 and an average flux path (6) length of 4 m. An air gap of length 10 cm is cut across the ring. Obtain the mmf required to establish a flux of 3 mWb in the air gap. Assume the relative permeability of steel as 1000.

15 A current of 5A flows through a non inductive resistance in series with a choke coil (10) when supplied at 250V, 50Hz. If the voltage across the resistance is 125V and that across the coil is 200V, calculate (i) Impedance, reactance and resistance of the coil (ii) Power absorbed by the coil and (iii) Total power absorbed by the circuit.

16 a) Two impedances Z_1 and Z_2 when connected separately across a 200 V 50 Hz supply (5) consume powers of 100 W and 60 W at power factors of 0.5 lagging and 0.6 leading respectively. If the impedances are now connected together in series across the same supply, determine the power absorbed and resulting power factor.

   b) A resistance R, an inductance $L = 0.01H$ and a capacitance C are connected in series. (5) When a voltage $v = 400 \cos(3000t - 10)$ V is applied to the series combination, the current flowing is $10\sqrt{2} \cos(3000t - 55)$ A. Find R and C.

PART C
Answer any one full question from each module, each carries10 marks.
Module V

17 Calculate the value of R$_1$ in the circuit given such that circuit will resonate. (10)
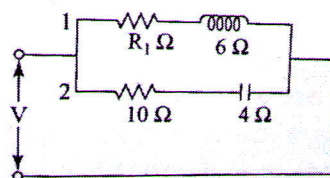
18 a) Explain parallel resonance and draw graphs of Z, X_L and X_C against frequency (6)

b) Define bandwidth of a resonant circuit. Give the relationship of quality factor in (4)
terms of bandwidth and resonant frequency.

Module VI

19 a) The total power consumed in a balanced star connected load is 20kW at 0.8 pf (6)
lag when supplied from a three phase 400 V, 50 Hz source. Calculate the line
current, resistance and inductance of the load impedance.

b) A balanced delta connected load connected across a 440V, 50 Hz three phase (4)
supply draws a line current of 16 A which lags behind the phase voltage by an
angle of 36.86°. Calculate the impedance of the load, phase current, power factor,
and total power.

20   A 220V, 50Hz, 3 phase voltage is applied to a balanced delta connected load of (10)
phase impedance (6+8j) Ω. Find the line currents and power consumed per phase.
Also draw the phasor diagram.

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