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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech degree examinations (S), September 2020 (S1/S2 - 2015 Scheme)

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		A conductor of length 0.4 m situated at right angles to a uniform magnetic field of flux density 1Wb/m^2 moves with a velocity of 70m/s. Calculate the emf induced if the conductor moves at an angle 30^0 to the field.	(4)
2		State and explain Kirchhoff's voltage and current laws. These laws express the conservation of two important physical quantities. Name them.	(4)
3		Derive the expression for energy stored in an inductor.	(4)
4		A coil of 200 turns is wound on a wooden ring of radius 7.95 mm and cross-sectional area of 200 mm^2. Obtain flux density in the core and total flux, when a current of 10A is flowing through the coil.	(4)
5		Prove that the power consumed by a purely inductive ac circuit is zero.	(4)
6		Find the RMS value of a full wave rectified sinusoidal current.	(4)
7		What is meant by power factor of an ac circuit? What are its minimum and maximum values?	(4)
8		An impedance of (3+j4) Ω is connected across a 100V single phase ac supply. Find the current, active power, reactive power and power factor.	(4)
9		A balanced delta connected load consists of three 20∠40° Ω impedances connected to a three phase 400V, 50Hz supply. Find the line current, power factor and total power consumed.	(4)
10		List the advantages of three phase systems over single phase systems.	(4)

PART B

Answer any four full questions, each carries 10 marks.

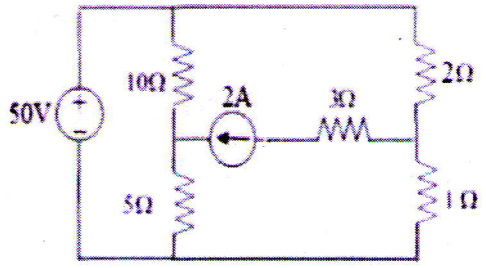
11	a)	Derive an expression for the energy stored in an inductor.	(4)
	b)	Coil A and B in a magnetic circuit have 750 and 600 turns respectively. A current of 10 A in coil A produces a flux of 0.02 Wb in it. If the coefficient of coupling is 0.2, calculate	(6)

i) Self-inductance of coil A when coil B is open circuited

ii) Emf induced in coil B when flux changes to zero in 0.01s, and

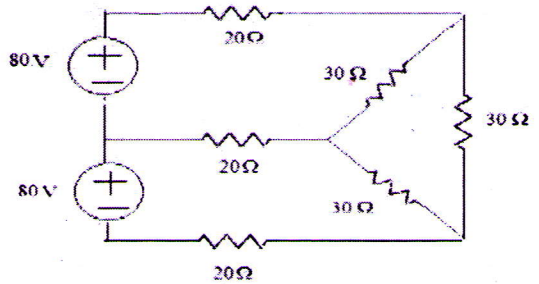
iii) Mutual inductance.

12 Determine the power delivered to the 10Ω and 5Ω resistors in the given circuit. (10)



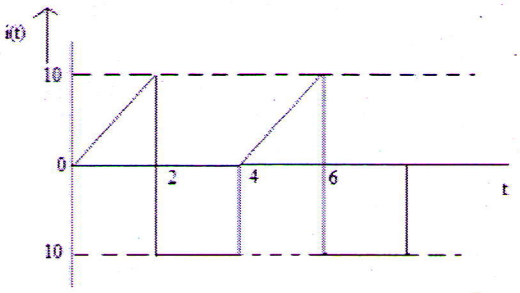
13 A magnetic core in the form of a closed ring has a mean length of 20 cm and cross sectional area of 1 cm^2. The relative permeability of iron is 2400. What direct current will be needed in a coil of 2000 turns uniformly wound around the ring to create a flux of 0.2 mWb in the iron? If an air gap of 1mm is cut through the core perpendicular to the direction of this flux what current will now be needed to maintain the same flux in the air gap? What fraction of the ampere turns is required to maintain the flux in the air gap? (10)

14 Write the mesh equations and find the mesh currents for the circuit shown below. Also find power delivered by the sources. (10)



15 A current of 5 A flows through a non inductive resistance in series with a choke coil when supplied at 250 V, 50 Hz. If the voltage across the resistance is 125 V and that across the coil is 200V, calculate (a) impedance, reactance and resistance of the coil, (b) the power absorbed by the coil, and (c) the total power. Also draw the phasor diagram of voltage. (10)

16 Determine the RMS and average values of the current waveform shown below. (10)



PART C

Answer any one full question from each module, each carries 10 marks.

Module V

17 An RLC series circuit consists of a resistance of 100 Ω, an inductance of 10 mH and capacitance of 10 μF. If a voltage of 200 V is applied across the combination find (i) resonant frequency (ii) Q factor of the circuit and half power frequencies. (10)

18 a) For an R-L-C series circuit with R=10 Ω, L=0.1 H and C=10 μF is excited with an alternating voltage source. Determine the impedance (i) at resonant frequency, (ii) 10 Hz above resonant frequency, and (iii) 10 Hz below resonant frequency. (8)

b) Draw the variation of impedance with respect to frequency of an R-L-C series circuit. (2)

Module VI

19 a) Three resistances 5 Ω, 10Ω and 15 Ω are connected in star and connected across a 230 V, 50 Hz supply. Calculate the current through each resistor. (6)

b) A balanced delta connected load of each arm has a resistance of 40 Ω per phase. Calculate the line, phase currents and power of the circuit if it is connected across a 440V, 50 Hz supply. (4)

20 a) Describe the measurement of power of a three phase circuit by two wattmeter method and obtain the expression for power and power factor. (10)

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