Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: BE101-03

Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries4 marks. Marks

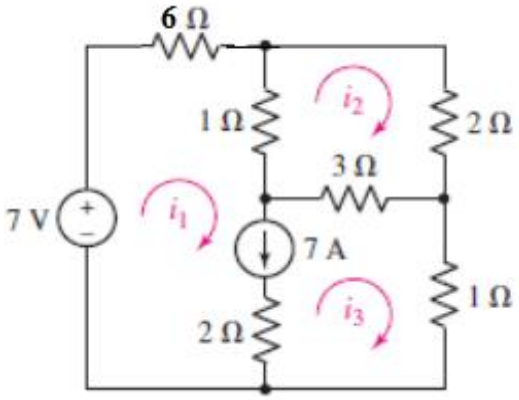
1		Deduce an expression for the energy stored in a magnetic field?	(4)
2		A coil of 160 turns is linked with a flux of 0.02 Wb when carrying a current of 12A. Calculate the inductance of the coil. If the current is uniformly reversed in 0.02 s, calculate the induced emf.	(4)
3		State and explain Kirchhoff's voltage and current laws.	(4)
4		Distinguish between self and mutual inductances. Derive an expression for the self inductance of a coil.	(4)
5		Express $i(t) = 20 \sin(628t - 30)$ in polar and rectangular forms.	(4)
6		Prove that the power consumed by a purely capacitive ac circuit is zero.	(4)
7		Distinguish between (i) apparent power, (ii) active power, and (iii) reactive power.	(4)
8		Prove that average power in an ac circuit is VI cosϕ, where V is the RMS value of voltage, I is the RMS value of current and cosϕ is the power factor.	(4)
9		Calculate the line currents, power factor and power consumed in a three phase star connected load consisting of three equal impedances of (20+j10) Ω connected across a three phase source of 400V, 50Hz.	(4)
10		Write any four advantages of three phase systems over single-phase systems.	(4)

PART B

Answer any four full questions, each carries10 marks.

11	a)	State and explain Faraday's laws of electromagnetic induction.	(4)
	b)	A coil of 800 turns is wound on a ring of silicon steel, having mean diameter of 9 cm and relative permeability of 1100. Its cross sectional area is 12cm^2. When a current of 6 A flows through the coil, find i. Flux in the core ii. Inductance of the coil iii. Induced emf if the flux falls to zero in 20ms.	(6)
12		Use Mesh analysis to determine currents I_1, I_2, I_3 and current through the 3Ω	(10)

resistor in the circuit below.

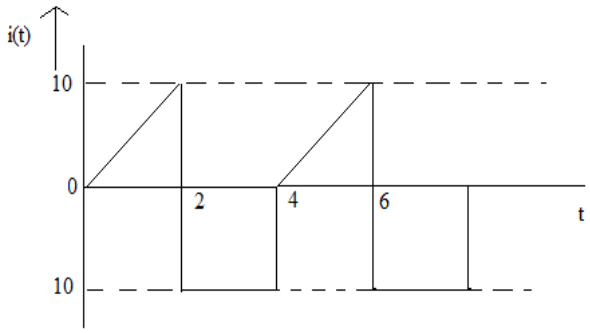


13 An iron ring has a diameter of 21 cm and a cross sectional area of 10 cm^2. The ring is made up of semicircular sections of cast iron and cast steel with an air gap of 0.2 mm. Find the ampere turns required to produce a flux of 8 mWb. The relative permeability of cast steel and cast iron are 800 and 166, respectively. (10)

14 a) Compare (by writing both similarities and differences) electric and magnetic circuits. (6)

b) Derive the equivalent reluctance of two magnetic circuits in parallel. (4)

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



16 A non inductive resistor of 10Ω is connected in series with a choke coil having an internal resistance of 1.2 Ω and is fed from a 200 V, 50 Hz supply. The current flowing through the circuit is 8 A. Calculate (i) Inductance of the choke coil (ii) Voltage across the choke coil (iii) Power absorbed by the choke coil (iv) Power absorbed by the non-inductive resistor (v) Phasor diagram of voltage. (10)

PART C

Answer any one full question from each module, each carries10 marks.

Module V

17 A 50Hz sinusoidal voltage of (40+j30) V is applied to a series RL circuit resulting in a current of (4+j1) A. Calculate (i) Impedance of the circuit (ii) (10)

Power consumed in the circuit (ii) Power factor of the circuit.

18 a) 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) Compare star and delta connected three phase power supply systems. (4)

b) A three-phase delta connected load consists of three similar impedances of (10+12j) Ω. Find the line current and total power absorbed if it is connected to a 415V, 50Hz supply. (6)

20 a) Calculate the phase and line currents and the load impedance parameters in a balanced delta connected load which consumes a power of 25 kW at 0.866 power factor lag fed from a three phase 400V, 50 Hz supply. (6)

b) A balanced three phase load consumes a power of 10 kW at 0.9 pf lag. If the power is measured by two wattmeter method, calculate the readings of the two watt-meters. (4)

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