Total No. of Questions – [4]

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MAY 2023 (INSEM+ ENDSEM) EXAM

F.Y. B. TECH. (SEMESTER - II)

COURSE NAME: BASIC ELECTRICAL ENGINEERING

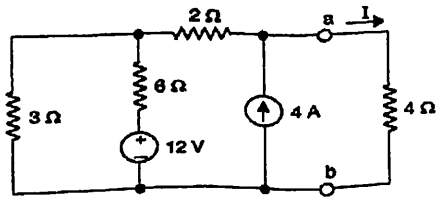
COURSE CODE: ET10203A

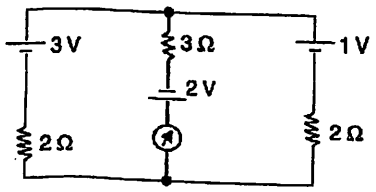
(PATTERN 2020)

Time: [2Hr] [Max. Marks: 60]

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data where ever required**

Question No.	Question Description	Marks	CO mapped	Blooms Taxonomy Level
Q.1	i) For the circuit shown in Fig.1, the open circuit voltage across the terminals a and b after removing 4 Ω resistance from the circuit is  Fig.1 a) 16 V b) 4 V c) 12 V d) 20 V	[2]	1	Apply
	ii) For the circuit shown in Fig.1, the equivalent resistance seen by the open terminals a and b after removing 4 Ω resistance and disabling all the sources in the network is a) 1.636 Ω b) 1 Ω c) 4 Ω d) 11 Ω	[2]	1	Apply
	iii) For the circuit shown in Fig.1, the voltage drop across 4 Ω resistance will be a) 10 V b) 20 V c) 30 V d) 15 V	[2]	1	Apply
	iv) For the circuit shown in Fig.1, the short circuit current flowing through the terminals a and b after removing 4 Ω resistance from the circuit is a) 4 A b) 5 A c) 10 A d) 0 A	[2]	1	Apply

	v) For a circuit shown in Fig. 1, the current in flowing through 4 Ω resistance is a) 5 A b) 10 A c) 2.5 A d) 0 A	[2]	1	Apply
	vi) For a circuit shown in Fig.1, the current flowing through 4 Ω resistance due to 12 V voltage source acting alone will be a) 5 A b) 0 A c) 0.5 A d) 2.5 A	[2]	1	Apply
	vii) For a circuit shown in Fig.1, the current flowing through 4 Ω resistance due to 4 A current source acting alone will be a) 2 A b) 2.5 A c) 0.5 A d) 0 A	[2]	1	Apply
	viii) The current shown by ammeter for a circuit shown in Fig.2 in the branch containing 3 Ω resistance in series with 2 V voltage source is  Fig. 2 a) 0 A b) 1 A c) 1.5 A d) 2.5 A	[2]	1	Apply
	ix) A sinusoidal voltage is given by the expression $v = 100 \sin(\omega t + \theta)$ Volts. At $t = 0$, the instantaneous value of voltage is found to be 50 Volts. The time at which the voltage will reach its positive maximum will be _____ ms if the frequency of the supply is 50 Hz. a) 5 b) 3.33 c) 1.67 d) 6.66	[2]	2	Apply
	x) The average value of a current over a half cycle is found to be 10 A. The amplitude and rms value of this current in amperes must be respectively a) 10, 11.1 b) 15.7, 10 c) 15.7, 11.1 d) 11.1, 15.7	[2]	2	Understand
	xi) When a pure capacitance of 100 μF is connected across a single phase, 230 V, 50 Hz, ac supply, the expression for current is a) $i = 10.22 \sin(314t + 90^0)$ A b) $i = 7.22 \sin(314t + 90^0)$ A c) $i = 10.22 \sin(314t - 90^0)$ A d) $i = 7.22 \sin(314t - 90^0)$ A	[2]	2	Apply
	xii) If an apparent power drawn by a series R-L circuit is 1300 VA while the active power is 1200 W when connected across a single phase, 300 V, 50 Hz ac supply, the inductive reactance connected in the circuit in Ω will be a) 75 b) 69.23 c) 63.90 d) 26.61	[2]	2	Apply
	xiii) A resistance of 100 Ω and capacitance of 50 μF are connected in series across a 200 V, 50 Hz ac supply. The voltage in Volts across the capacitor will be a) 123.5 b) 168.7 c) 200 d) 107.4	[2]	2	Apply

	xiv) A resistance of 20 Ω and an inductance of 20 mH are connected in series across a single phase, 200 V, 50 Hz ac supply. The reactive power in VAR will be a) 571.85 b) 1908.06 c) 1820.35 d) 1143.7	[2]	2	Apply
	xv) A series circuit consisting of a resistance of 100 Ω, an inductor of inductance 0.6 H and a variable capacitor connected across a single phase, 220 V, 50 Hz ac supply. The value of the capacitance of the capacitor at which the current in the circuit will reach its maximum is a) 16.88 nF b) 16.88 mF c) 16.88 F d) 16.88 μF	[2]	2	Apply
Q2	**Solve any three out of four** a) A 30 KVA, 2000/200 V, 50 Hz, single phase transformer has a full load copper losses of 787.5 W on high voltage side and 337.5 W on low voltage side. Determine i) the high voltage and low voltage winding resistances ii) the equivalent resistance referred to low voltage side.	[5]	3	Apply
	b) A 200 kVA, 50 Hz, single phase transformer has an efficiency of 95 % on full load at 0.8 power factor and on half load at 0.8 power factor. Determine its percentage efficiency at unity power factor under the loading condition of 75 % of its full load.	[5]	3	Apply
	c) The resistance and leakage reactance of a single phase 10 KVA, 2200/220 V distribution transformer are as given below. High voltage (HV winding):- $r_1 = 4\ \Omega$, $x_1 = 5\ \Omega$ Low voltage (LV winding):- $r_2 = 0.04\ \Omega$, $x_2 = 0.05\ \Omega$ The transformer is supplying rated KVA at 0.8 power factor lagging to a load at rated voltage. Determine the % voltage regulation. At what power factor will the % voltage regulation be zero?	[5]	3	Apply
	d) Draw the exact equivalent circuit of a single phase transformer and state various types of losses that occur in case of a single phase transformer.	[5]	3	Understand
Q.3	**Solve any three out of four** a) Three coils each of resistance 100 Ω and an inductance of 0.211 Henry are connected in delta across a symmetrical three phase, 440 V, 50 Hz ac supply. Calculate i) phase current ii) phase voltage iii) line current iv) active power consumed in kW (upto 3 digits after the decimal point) v) reactive power in kVAR (upto 3 digits after the decimal point)	[5]	4	Apply
	b) Draw a neat phasor diagram for a three phase balanced star connected capacitive type of load in each phase across a symmetrical three phase ac supply and hence derive the relationship between the line voltage and phase voltage.	[5]	4	Apply

	c) An electrically driven pump lifts 80 m^3 of water per minute and consumes total electrical energy of 16817.4 kWh for a month of 30 days when operates for 2 hours per day. The efficiencies of motor and pump are 70 % and 80 % respectively. Calculate the height to which water is raised by the pump. Assume 1 m^3 of water to weigh 1000 kg and take 'g' as 9.81 m/s^2.	[5]	4	Apply
	d) An electric hoist makes 10 double journeys per hour. In each journey, a load of 6 tonnes is raised to a height of 60 meters in 90 seconds. The hoist cage weights 0.5 tonne when empty while the counter-weight weighs 3 tonnes. The efficiency of the hoist is 80 % and of the driving motor 88 %. Calculate i) electric energy absorbed per double journey ii) hourly energy consumption in kWh iii) cost of electrical energy consumption if the hoist works for 4 hours/day for 30 days. Cost per kWh of electricity is 50 paise. Take 'g' as 9.81 m/s^2.	[5]	4	Apply