Total No. of Questions – [4]

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DECEMBER 2022 (INSEM+ ENDSEM) EXAM

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

COURSE NAME: BASIC ELECTRICAL ENGINEERING

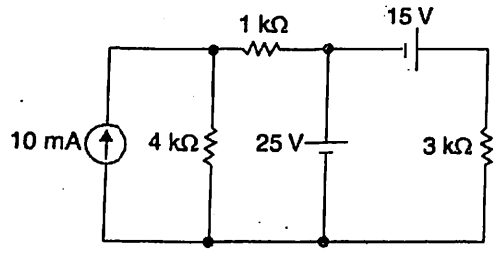
COURSE CODE: ET10203A

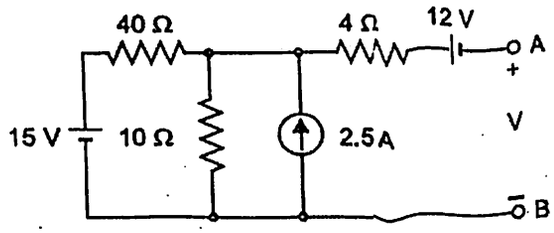
(PATTERN 2020)

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 below, the voltage across 4 kΩ resistance with only 10 mA current source acting alone will be  Fig.1 a) 8 V b) 10 V c) 0 V d) 2 V	[2]	1	Apply
	ii) For the circuit shown in fig.1, the current in 1 kΩ resistance with only 25 V voltage source acting alone will be a) 13.33 mA b) 5 mA c) 1.50 mA d) 8.33 mA	[2]	1	Apply
	iii) For the circuit shown in fig.1, the voltage across 1 kΩ resistance will be a) 8 V b) 13 V c) 3 V d) 5 V	[2]	1	Apply
	iv) For the circuit shown in fig.1, the voltage across 1 kΩ resistance with only 15 V voltage source acting alone will be a) 10 V b) 8 V c) 2 V d) 0 V	[2]	1	Understand

v) For a circuit shown in fig. 2, the equivalent resistance seen by the open terminals A and B after disabling all the sources in the network is  Fig. 2 a) 2.67 Ω b) 12 Ω c) 54 Ω d) 8 Ω	[2]	1	Apply
vi) For a circuit shown in fig.2, the short current flowing through the terminals A and B after shorting them will be a) 1.09 A b) 0.917 A c) 2.88 A d) 0 A	[2]	1	Apply
vii) For a circuit shown in fig.2 with 12 Ω as a load branch resistance connected across the terminals A and B, the voltage across the load branch will be a) 11 V b) 3 V c) 5.5 V d) 3.5 V	[2]	1	Apply
viii) A current of 10 A flows through two ammeters A and B connected in series in some circuit, the potential difference across A is 0.1 V and that across B is 0.15 V. The current shown by ammeter A when they are joined in parallel will be a) 10 A b) 8 A c) 4 A d) 6 A	[2]	1	Apply
ix) If an apparent power drawn by a series R-L circuit is 500 VA while the reactive power is 300 VAR when connected across a single phase, 300 V, 50 Hz ac supply, the inductive reactance connected in the circuit in Ω will be a) 144 b) 180 c) 103 d) 150	[2]	2	Apply
x) A resistance of 100 Ω and capacitance of 50 μF are connected in series across a 250 V, 50 Hz single phase ac supply. The active power consumed by the circuit in watt is a) 772 b) 444.75 c) 527.22 d) 283.12	[2]	2	Apply
xi) A resistance of 20 Ω and an inductance of 30 mH are connected in series across a single phase, 230 V, 50 Hz ac supply. The reactive power in VAR will be a) 2392.64 b) 2164.39 c) 1019.87 d) 1082.35	[2]	2	Apply
xii) A resistance of 100 Ω and capacitance of 50 μF are connected in series across a 250 V, 50 Hz ac supply. The voltage in Volts across the resistor will be a) 123.5 b) 250 c) 210.9 d) 134.25	[2]	2	Apply

	xiii) 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 70.71 Volts. The time at which the voltage will reach its positive maximum will be _____ msec if the frequency of the supply is 50 Hz. a) 5 b) 2.5 c) 3.33 d) 1.67	[2]	2	Apply
	xiv) When a pure inductance of 100 mH is connected across a single phase, 230 V, 50 Hz, ac supply, the expression for current is a) $i = 7.32 \sin(314t - 90^0)$ A b) $i = 7.32 \sin(314t + 90^0)$ A c) $i = 10.35 \sin(314t - 90^0)$ A d) $i = 10.35 \sin(314t + 90^0)$ A	[2]	2	Apply
	xv) A series circuit consisting of a resistance of 100 Ω, a variable inductor and a capacitor of 16.88 μF connected across a single phase, 220 V, 50 Hz ac supply. The value of the inductance for inductor at which the impedance of the circuit will be minimum is a) 0.6 μH b) 0.6 mH c) 6 H d) 0.6 H	[2]	2	Apply
Q2	**Solve any three out of four** a) The no load, and full load unity power factor readings of a direct loading test on a single phase transformer are as given below. Determine i) Full load copper losses ii) % efficiency and iii) % voltage regulation at full load with unity power factor.	[5]	3	Apply

	Primary Side			Secondary Side	
	V_1 (V)	I_1 (A)	W_1 (W)	V_2 (V)	I_2 (A)
No load Test	220	1.65	75	110	0
Full Load Test (at Unity pf)	220	18	3700	102.5	35

	b) A 3300 /110 V, 50 Hz, 50 KVA single phase transformer has iron losses of 500 W. The primary and secondary winding resistances are respectively 3.3 Ω and 0.011 Ω. Determine % efficiency of the transformer on full load having 0.8 leading power factor. Also find the % voltage regulation at full load with unity power factor.	[5]	3	Apply
	c) The iron loss of a 100 kVA, 1000/250 V, 50 Hz, single phase transformer is 1 kW. The copper losses when primary carries a current of 50 A is 500 W. Calculate: (i) Area of cross section of limb if working flux density is 0.9 T and primary has 1000 turns. (ii) Primary and secondary full load currents (iii) % Efficiency at full load having 0.8 lagging power factor.	[5]	3	Apply
	d) State following with reference to a single phase autotransformer. i. Any two relevant advantages ii Any one	[5]	3	Remembe r

	relevant disadvantage iii. Any two applications			
Q.3	**Solve any three out of four**			
	a) Three coils each of resistance R and an inductance of L Henry are connected in star across a symmetrical three phase, 415 V, 50 Hz ac supply. The total active power is √3 times the total reactive power and the circuit draws an apparent power of 3.6 KVA. Calculate the value of resistance R and inductance L connected in each phase of the load.	[5]	4	Apply
	b) Draw a neat phasor diagram for a three phase balanced delta connected lagging power factor type of load with a power factor angle of Φ in each phase across a symmetrical three phase ac supply and hence derive the relationship between the line current and phase current.	[5]	4	Understand
	c) An A dc electric motor drives a locomotive takes a current of 3.72 A when connected to 11 kV supply while moving up on an incline plane of 1 in 100. The mass of the locomotive is 10000 kg while frictional force offered by the track is 10×9.81N per 1000 kg mass of the locomotive. If the overall efficiency of the system is 90%, calculate the steady speed at which the locomotive is moving.	[5]	4	Apply
	d) The daily usage pattern of various electrical appliances in a typical house is as given below.	[5]	4	Apply

Sr. No.	Electrical Appliance	Power rating	Quantity	Usage Time
1	Ceiling Fan	70 W	5	8 Hrs.
2	Fluorescent Tube	36 W	5	8 Hrs.
3	Television set	85 W	1	8 Hrs.
4	Washing Machine	500 W	1	45 min
5	Refrigerator	70 W	1	24 Hrs.
6	Electric Iron	1 kW	1	15 min
7	Miscellaneous Load	55 W	--	5 Hrs.

Calculate i) the total monthly electricity consumption in kWh for a month of 30 days.

ii) Monthly electricity bill for a month of 30 days in Rs. with the tariff Fixed charges Rs: 115/- Energy charges Rs. 3/- per unit for first 100 units Rs. 4/- per unit from 101 to 300 units Rs. 5/- per unit from 301 units onwards.

iii) What will be monthly reduction in units if some of the appliances are replaced by energy efficient appliances for achieving energy conservation? Fluorescent Tube is replaced by LED type tube of 21 W. Ceiling fan replaced by energy efficient fan of 60 W. Refrigerator replaced by more energy efficient one of rating 60 W and Television set replaced by energy efficient one of rating 52.5 W