Total No. of Questions – [4] Total No. of Printed Pages: 4

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DECEMBER 2021 (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 wherever required**

Q.1 **Solve the following**

i) For the circuit shown in fig. 1 below, the current in 3 Ω resistance with only 20 V voltage source acting alone will be [2]

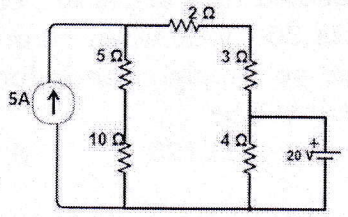

Fig.1

a) 3.75 A b) 1 A c)1.50 A d)2.75 A

ii) For the circuit shown in fig. 1, the current in 3 Ω resistance with only 5A current source acting alone will be [2]

a) 3.75 A b) 1 A c)1.50 A d) 2.75 A

iii) For the circuit shown in fig. 2 below with 4 Ω as a load branch resistance, the short circuit current flowing through it after removing the load branch from the circuit will be [2]

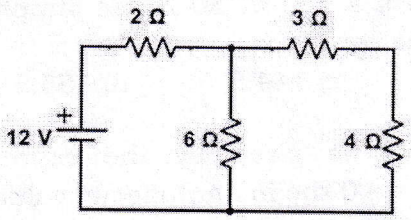

Fig. 2

a) 1.5 A b) 1 A c) 2 A d) 0.5 A

iv) For a circuit shown in fig. 2 with 4 Ω as a load branch resistance, the equivalent resistance seen by the open terminals after removing the load branch will be [2]

a) 11 Ω b) 2.5 Ω c) 3.5 Ω d) 4.5 Ω

v) For a circuit shown in fig. 2 the current flowing through 4 Ω resistance in Amperes will be [2]

a) 0.9333 A b)0.9411 A c) 1.0588 A d) 2.0597 A

vi) For a circuit shown in fig. 2 with 4 Ω as a load branch resistance, the open circuit voltage across the load terminals when the load branch is removed from the circuit will be [2]

a) 3.5 V b) 6 V c) 12 V d) 9 V

vii) A series R-C circuit with R = 2 MΩ and C = 0.01 μF is connected across the DC voltage source of 50 V. Determine the charging current after 0.06 sec. [2]

a) 1.245 μA b) 4.324 μA c) 2.345 μA d) 6.326 μA

viii) A 12 μF capacitor in series with 1.2 MΩ resistor is connected across a 100 V dc supply. Find the voltage across the capacitor 4 sec after switching on the dc supply in Volts will be. [2]

a) 20.49 b) 30.11 c) 24.25 d) 12.05

ix) If an active power consumed by a series R-L circuit is 400 W while the reactive power is 300 VAR when connected across a 250 V, 50 Hz single phase ac supply. The inductive reactance in Ω connected in the circuit will be [2]

a) 75 b)100 c) 125 d) 150

x) A resistance of 100 Ω and capacitance of 50 μF are connected in series across a 230 V, 50 Hz single phase ac supply. Find the reactive power consumed by the circuit in VAR. [2]

a) 239.65 b) 446.26 c) 376.46 d) 479.3

xi) A 20 Ω resistance and a 30 mH inductance are connected in series across 230V, 50 Hz ac supply. The active power of the circuit in Watt will be [2]

a) 2392 b) 2164.7 c) 1019.6 d) 1082.35

xii) A resistance of 100 Ω and capacitance of 50 μF are connected in series across a 230 V, 50 Hz ac supply. Find the voltage in Volts across the capacitor. [2]

a) 123.5 b) 133.5 c) 144.5 d) 155.5

xiii) A sinusoidal voltage is given by the expression $v = 200 \sin(\omega t + \theta)$ Volts. At t = 0 the instantaneous value of voltage is found to be 100 Volts. The time at which the voltage will reach its positive maximum will be _____ msec if the frequency of the supply is 50 Hz. [2]

a) 6.66 b) 1.67 c) 3.33 d) 5

xiv) The expression for current when a pure capacitor of 100 μF is connected across 230 V, 50 Hz, ac supply is [2]

a) $i = 20.21 \sin(314t - 90^0)$ A b) $i = 20.21 \sin(314t + 90^0)$ A
c) $i = 10.21 \sin(314t - 90^0)$ A d) $i = 10.21 \sin(314t + 90^0)$ A

xv) A series circuit consist of a resistance 120 Ω, an inductance of 0.6 H and a variable capacitor across a 240 V, 50 Hz supply. The value of the capacitor so that the current in the circuit is maximum. [2]

a) 1.688 μF b) 16.88 μF c) 168.8 μF d) 1688 μF

Q2 **Solve any three out of four**

a) A single phase 90 kVA, 3.2 kV/220 V, 50 Hz transformer has an efficiency of 89 % both at full load and at half load with unity power factor. Determine the constant and variable losses. Also compute the efficiency of this transformer at 70% of full load and 0.8 power factor leading. [5]

b) Draw a neat circuit diagram for direct loading test on a single phase transformer of 1 KVA, 220/110 V rating showing the appropriate meters on its primary (220 V) and secondary side (110 V) for measurements. Following meters are available for measurements. [5]
Ammeter (0 – 5 A), Ammeter (0 – 10 A), Wattmeter (5A, 150 V), Voltmeter (0 – 150 V), Wattmeter (10 A, 300 V)
Determine full load primary and secondary side currents of this single phase transformer considering the transformer to be ideal.

c) A single phase 5 kVA transformer has 400 turns on its primary and 1000 secondary turns. The net cross-sectional area of the core is 60 cm^2. When the primary winding is connected to 500 V, calculate (i) maximum value of flux density in the core with 50 Hz supply (ii) voltage induced in the secondary winding and (iii) secondary full load current. [5]

d) Draw the exact equivalent circuit of a single phase transformer showing all the relevant branches with appropriate resistance and reactance. State different types of losses occurring in case of transformers. [5]

Q.3 **Solve any three out of four**

a) Draw a neat phasor diagram for a three phase balanced [5]

star connected resistive load of resistance R in each phase across a symmetrical three phase ac supply and hence derive the relationship between the line voltage and phase voltage.

b) In a three phase delta connected balanced load connected across a symmetrical three phase, 400 V, 50 Hz ac supply, it is observed that each phase of the load carries a current of 7.071 A and the total active power is equal to the total reactive power. Calculate the value of resistance and inductance in each phase of the load. [5]

c) An electrically driven pump lifts 80 m^3 of water per minute and consumes total electrical energy of 16817.4 kWh per month of 30 days if the pump operates 2 hours per day. The efficiency of the motor and pump are 70% and 80% respectively. Calculate the height to which water is raised by the pump. [5]

d) The daily usage pattern of various electrical appliances in a typical house is as given below. [5]

Sr. No.	Electrical Appliance	Power rating	Quantity	Usage Time
1	Fluorescent Tube	36 W	5	5 Hrs.
2	Ceiling Fan	70 W	5	6 Hrs.
3	Electric Iron	1 kW	1	15 min
4	Oven	2 kW	1	12 min
5	Television set	85 W	1	4 Hrs.
6	Washing Machine	500 W	1	24 min
7	Refrigerator	65 W	1	24 Hrs.
8	Miscellaneous	50 W	1	5 Hrs.

Calculate the monthly electricity consumption in kWh for a month of 30 days. If two supply companies are supplying power at the following rate (tariff)

Company A:- Rs. 6.50/- per unit plus Rs. 450/- as fixed charges

Company B:- Rs. 5.50/- per unit plus Rs. 650/- as fixed charges

Which tariff is cheaper for a monthly electricity bill for a month of 30 days and by what amount?