Total No. of Questions – [4]

Total No. of Printed Pages: 4

| G.R. No. | |
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| PAPER CODE | U112–203 A (Reg) |
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# DECEMBER 2022 (INSEM+ ENDSEM) EXAM

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

## COURSE NAME: BASIC ELECTRICAL ENGINEERING

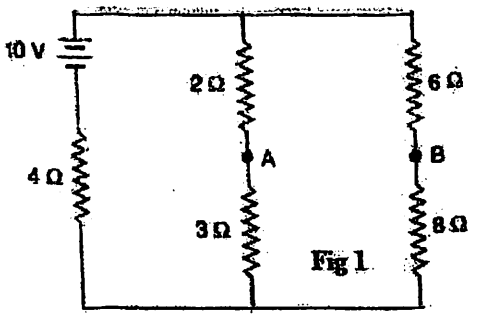
## COURSE CODE: ET10203A

### (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 wherever required**

| Question No. | Question Description | Marks | CO mapped | Blooms Taxonomy Level |
|---|---|---|---|---|
| Q.1 | **Solve the following** | | | |
| | **i)** Determine the resistor required to reduce the supply voltage from 120 V to 80 volts for the operation of a device. The device rating is 120 V, 100 watts.<br>a) 70 Ω b) 72 Ω c) 68 Ω d) 74 Ω | [2] | CO1 | Apply |
| | **ii)** Two resistances R1 and R2 are connected in parallel, and a voltage of 200 V is applied to the combination. The total current taken is 25A and the power dissipated in one of the resistance R1 is 1500 W. The value of resistance of R2 is<br>a) 26.67 Ω b) 11.42 Ω<br>c) 10.23 Ω d) 23.43 Ω | [2] | CO1 | Apply |
| | **iii)** Determine the potential difference across AB in Fig 1.<br>a) 0.14 V b) 1.5 V c) 15 V d) 14 V<br>  <br><br>Fig 1 | [2] | CO1 | Apply |

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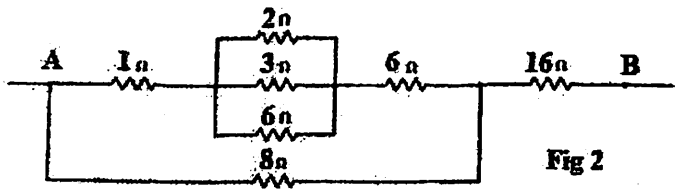
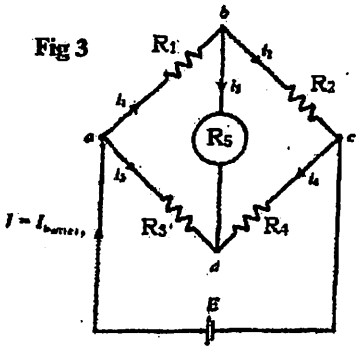
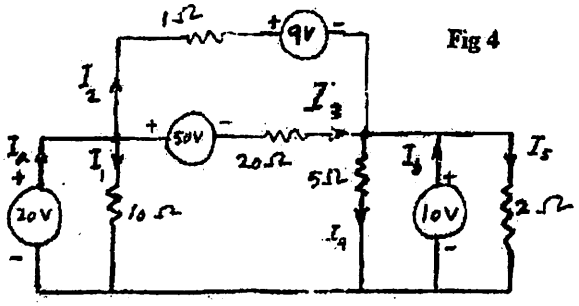
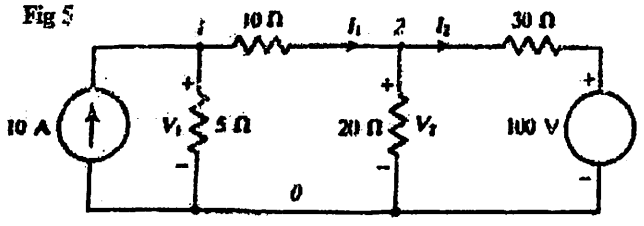
| | **v)** Find the equivalent resistance between A and B in Fig 2.<br>a) 10 Ω b) 20 Ω c) 30 Ω d) 40 Ω<br>  <br><br>Fig 2 | [2] | CO1 | Unde tand |
| | **v)** For the circuit of Fig. 3 consider the balanced bridge ($i_5$ =0). $R_1$ = 10Ω, $R_2$=20Ω, $R_3$ =30Ω, E =45 V. Resistance $R_4$ and the current supplied by the battery is respectively<br>a) 60Ω, 1A b) 60Ω, 2A c) 70Ω, 3A d) 80Ω, 3A<br>Fig 3<br>  <br> | [2] | CO1 | Apply |
| | **vi)** Calculate the current $I_3$ in the circuit of Fig. 4 by Thevenin's theorem.<br>a) 1 A, b) -1 A, c) 2 A, d) -2 A<br>Fig 4<br>  <br> | [2] | CO1 | Apply |
| | **vii)** Applying Norton's Theorem to given electric circuit Fig 5, find load current through 10 Ω and Norton's equivalent resistance $R_N$ are respectively<br>a) 3.17 A, 0.17 Ω b) 0.37 A, 17 Ω<br>c) 3.33 A, 10.10 Ω d) 3.44 A, 10 Ω<br>Fig 5<br>  <br> | [2] | CO1 | Apply |
| | **viii)** If R = 15 Ω and $X_c$= 55 Ω then the impedance in rectangular form can be expressed as.<br>a) (15 – j55) Ω b) (15 + j55) Ω<br>c) (10 – j15) Ω d) (10 + j15) Ω | [2] | CO2 | Under tand |

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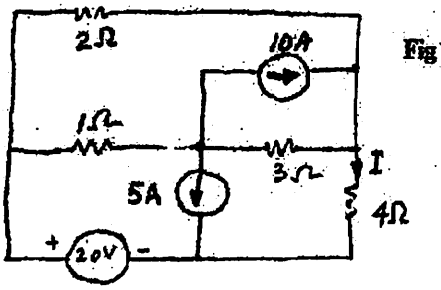
| | **ix)** For the given circuit below Fig 6, current flowing through resistance of 4 Ω using Superposition theorem will be.<br>a) 5.3125 A b) 2.2587 A c) 3.4562 A d) not applicable<br>  <br><br>Fig 6 | [2] | CO1 | Apply |
| | **x)** An alternating current varying sinusoidally with frequency 50Hz has r.m.s value of the current of 20 A. At what time, measured from negative maximum value, instantaneous will be $10\sqrt{2}$ A ?<br>a) 4.444 msec b) 5.556 msec c) 6.667 msec d) 7.778 msec | [2] | CO2 | Understand |
| | **xi)** calculate the resistance, inductance, and capacitance for impedance $20\angle 60^0$ Ω. Assume the supply frequency as 60Hz.<br>a) 10 Ω, 45.94 mH, 0 μF b) 10 Ω, 0 mH, 45.94 μF<br>c) 20 Ω, 44.94 mH, 44.94 μF d) 20 Ω, 17.32 mH, 17.32 μF | [2] | CO2 | Apply |
| | **xii)** A series circuit having pure resistance of 120 Ω, pure capacitive reactance of 250 Ω, are connected AC supply. This R and C combination draws a current of 0.9 A. Find active and reactive power of circuit.<br>a) -97.193 W, 202.498 VAR b) 97.193 W, -202.498 VAR<br>c) -97.193 W, -202.498 VAR d) 97.193 W, 202.498 VAR | [2] | CO2 | Apply |
| | **xiii)** Two coils A and B are connected in series across 200 V, 50Hz AC supply. The power input to the circuit is 2.2 kW and 1.5 kVAR. If the resistance of coil A is 4 Ω and the reactance is 8 Ω. Calculate resistance and reactance of coil B.<br>a) 0.5 Ω, 8.4 Ω b) 5.5 Ω, 4.4 Ω<br>c) 4.4 Ω, 5.5 Ω d) 8.4 Ω, 0.5 Ω | [2] | CO2 | Apply |
| | **xiv)** Two impedances $Z_1$ and $Z_2$ having same numerical values are connected in series. If $Z_1$ is having p,f. of 0.866 lagging and $Z_2$ is having p.f. of 0.6 leading. Calculate the p.f. of the series combination.<br>a) 0.8720 leading b) 0.8720 lagging<br>c) 0.9796 leading d) 0.9796 lagging | [2] | CO2 | Apply |
| | **xv)** In a series circuit having pure resistance of 40 Ω, pure inductance of 50.07 mH and a capacitor is connected across a 400 V, 50 Hz A.C supply. The power factor of the circuit will be.<br>a) 0.866 lag b) 0.8gg lead c) unity (d) insufficient data | [2] | CO2 | Apply |
| Q2 | **Solve any three out of four**<br><br>**a)** A 3000/200 V, 50 Hz, single-phase transformer has a cross-sectional area of 150 $cm^2$ for the core. If the number of turns on the low-voltage winding is 80, determine the number of turns on the high-voltage winding and maximum value of flux density in the core. | [5] | CO3 | Apply |

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| | **b)** A 30 kVA, 2400/120 V, 50 Hz transformer has high-voltage winding resistance of 0.1 Ω and leakage reactance of 0.22 Ω. The low voltage winding resistance is 0.035 Ω and leakage reactance is 0.012 Ω. Calculate equivalent resistance as referred to primary and secondary, equivalent reactance as referred to primary and secondary, copper loss at 75% of full load. | [5] | CO3 | Appl |
| | **c)** Iron loss of 80 kVA, 1000/250 V, single-phase, 50 Hz transformer is 500 W. The copper loss when the primary carries a current of 50 A is 400 W. Find (i) area of cross section of limb if working flux density is 1 T and there are 1000 turns on the primary, (ii) efficiency at full load and pf 0.8 lagging, and (iii) efficiency at 75% of full load and unity pf. | [5] | CO3 | Appl |
| | **d)** The no load and full load unity power factor readings of direct loading test on single phase transformer are as given below. Find its efficiency and voltage regulation at full load, unity pf. | [5] | CO3 | Appl |

| No load Test | Primary Side | | | Secondary Side | |
|---|---|---|---|---|---|
| | $V_1$ | $I_1$ | $W_1$ | $V_2$ | $I_2$ |
| | 220V | 1.65A | 75W | 110V | 0A |
| Full load unity p.f | 220V | 18A | 3700W | 102.5A | 35A |

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| Q.3 | **Solve any three out of four** | | | |
| | **a)** An electrical lift makes 12 double journeys per hour. A load of 5 ton is raised by it through a height of 50 m and it returns empty. The lift takes 65 seconds to go up and 48 seconds to return. The weight of the cage is 0.5 ton and that of the counterweight is 2.5 ton. The efficiency of the lift mechanism is 80% and the motor efficiency is 85%. Calculate the hourly consumption in kWh. Assume 1 ton = 1000 kg. | [5] | CO4 | Apply |
| | **b)** A 3 ton electric-motor-operated vehicle is being driven at a speed of 24 km/hr upon an incline of 1 in 20. The tractive resistance may be taken as 20 kg per ton. Assuming motor efficiency of 85% and the mechanical efficiency between the motor and road wheels of 80%, calculate (a) the output of the motor, (b) the current taken by motor if it gets power from a 220-V source. Assume 1 ton = 1000 kg. | [5] | CO4 | Apply |
| | **c)** An electric pump lifts 1.2 $m^3$ of water per minute to a height of 15 m. If its overall efficiency is 60%, find the input power. If the power is used for 4 hours a day, find the daily cost of the energy at the rate rupees 3.36 per kWh. | [5] | CO4 | Ap |
| | **d)** When the three identical star-connected coils are supplied with 440 V, 50 Hz, 3- phase supply, the 1- phase wattmeter whose current coil is connected in line R and pressure coil across the phase R and neutral reads 6 kW and the ammeter connected in R-phase reads 30 A. Assuming RYB phase sequence find:<br>(i) resistance and reactance of the coil<br>(ii) the power factor of the load<br>(iii) total reactive power | [5] | CO4 | Ap |