Total No. of Questions – [4]

Total No. of Printed Pages: 4

G.R. No.	

PAPER CODE	U111-203A(RE)

MAY 2022 (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 wherever required.**

Q.1 **Solve the following**

i) For a given network as shown in Fig.1, considering 4Ω as a load resistance, the value of R_{eq} using Thevenin's theorem is [2]

a) 14 Ω b) 15 Ω

c) 16 Ω d) 17 Ω

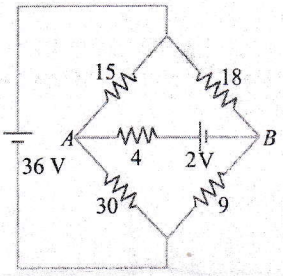

Fig.1

ii) A battery of 24V is applied across terminals AB of the circuit shown in Fig. 2. The current in 2Ω resistor will be [2]

a) 3 A b) 6 A

c) 2.5 A d) 1.5 A

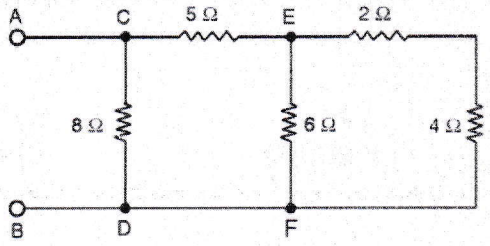

Fig.2

iii) For a given network as shown in Fig.3, considering 1Ω as a load resistance, the value of I_N using Norton's theorem is [2]

a) 1.5 A b) 2.5 A

c) 3.5 A d) 4.5 A

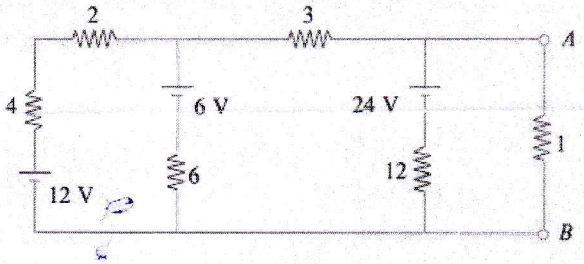

Fig.3

iv) Referring to Fig.4, the total circuit resistance will be [2]

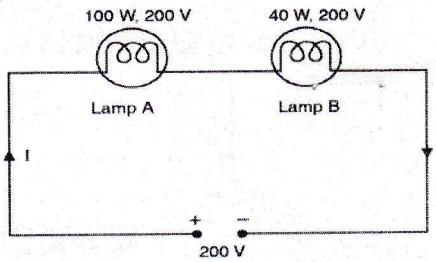

Fig.4

a) 1000 Ω
b) 400 Ω
c) 1400 Ω
d) 135 Ω

v) Three equal resistors are connected as shown in the Fig.5. Find the equivalent resistance between points A and B. [2]

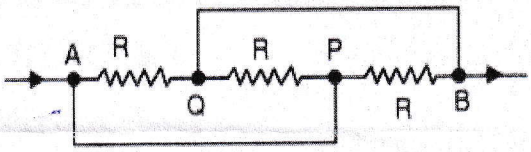

Fig.5

a) 3R
b) R/3
c) 3R/2
d) 2R/3

vi) Applying Norton's Theorem to the circuit shown in Fig.6, the short circuit current (I_N or I_{SC}) and Norton's equivalent resistance R_N are respectively [2]

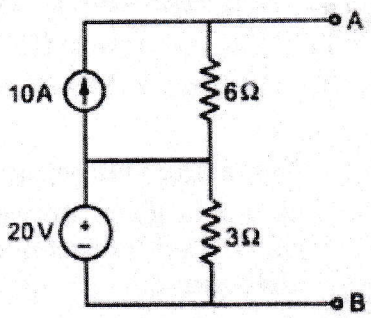

Fig.6

a) 11.11 A, 9 Ω
b) 13.33 A, 9 Ω
c) 11.11 A, 6 Ω
d) 13.33 A, 6 Ω

vii) For given electric circuit in Fig. 7, current flowing through resistance of 20 Ω using Kirchhoff's laws is [2]

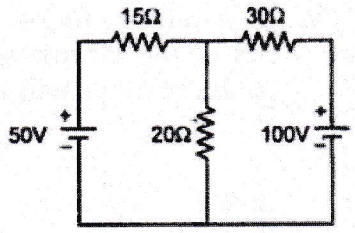

Fig.7

a) 1.11 A
b) 2.22 A
c) 3.33 A
d) 4.44 A

viii) For the circuit shown in the Fig. 8, current flowing through resistance of 15Ω using Superposition theorem is due to source S1 only will be [2]

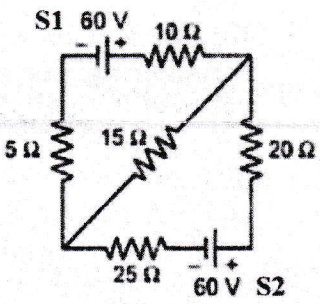

Fig.8

a) 1.7142 A
b) 2.2587 A
c) 3.4562 A
d) none of the above

ix) If R=15 Ω and X_L=55 Ω, then the impedance in rectangular form can be expressed as [2]

a) (15 – j55) Ω
b) (15 + j55) Ω

x) An alternating current, i=414sin(100*π*t) A is passed through a series circuit consist of R=100 Ω & inductance of 0.31831 What will be expression for the instantaneous value of the voltage across i) inductance and ii) combination [2]

a) V_L=141.4 sin(100*π*t + 90⁰), V=200 sin(100*π*t + 45⁰)
b) V_L=141.4 sin(100*π*t + 45⁰), V=200 sin(100*π*t + 90⁰)
c) V_L=200 sin(100*π*t + 90⁰), V=141.4 sin(100*π*t + 45⁰)
d) V_L=200 sin(100*π*t + 90⁰), V=141.4 sin(100*π*t + 45⁰)

xi) The voltage and current of the circuit is given by; [2]

e = 120 sin(314t), i = 10 sin(314t + π/6)

Calculate values of R and C which are connected in series to form circuit.

a) 10.393 Ω, 276.77 μF
b) 16.873 Ω, 644.76 μF
c) 20.393 Ω, 740.50 μF
d) 10.393 Ω, 530.45 μF

xii) A series circuit having pure resistance of 40 Ω, pure inductance of 50.07 mH, and capacitor is connected across a 400 V, 50 Hz, AC supply. This combination draws a current of 10 A. The power factor of circuit and capacitor value is respectively [2]

a) 0.92 lag, $20.10*10^{-3}$ F
b) 0.92 lead, $20.10*10^{-3}$ F
c) 1, $2.023*10^{-4}$ F
d) 1, $2.023*10^{-6}$ F

xiii) A series RLC circuit is connected to 230V ac supply. The current drawn by circuit at resonance is 25 A and voltage drop across capacitor is 4000 V. Calculate resonant frequency and inductance value if capacitance is 5μF. [2]

a) 180.567 Hz, 0.111 H
b) 198.943 Hz, 0.128 H
c) 200.954 Hz, 0.168 H
d) 150.563 Hz, 0.156 H

xiv) If V_1= 4+j3 volts and V_2= 5+j6 volts, the product $V_1 \times V_2$ in volts as expressed in polar form will be [2]

a) 0.64 ∠ -13.32
b) 39.05 ∠ 87.06
c) 7.81 ∠ 50.19
d) 7.81 ∠ - 50.19

xv) In a series RLC circuit at resonance, the magnitude of the voltage developed across the capacitor [2]

(a) is always zero.
(b) can never be greater than the input voltage.
(c) can be greater than input voltage and it is 90⁰ out of phase with the input voltage.
(d) is in phase with the input voltage.

Q2 **Solve any three out of four**

a) For a single phase transformer having primary and secondary turns of 440 and 880 respectively, determine the transformer kVA rating if half load secondary current is 7.5A and maximum value of core flux is 2.25 mWb. [5]

b) The iron loss of 100kVA, 1000/250V, single phase 50Hz, transformer is 1000W. The copper loss when primary carries current of 50A is 500W. Find i) Area of cross-section of limb if working flux density is 0.9T and primary has 1000 turns ii) Primary and secondary currents iii) Efficiency at fall-load and 0.3 power factor. [5]

c) A single phase 100 kVA, 3.3 kV/230 V, 50 Hz transformer has 89.5% efficiency at 0.85 lag pf. both at full load and also at half load. Determine the efficiency of the transformer at 75% load and 0.9 lead pf. [5]

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 and unity pf. [5]

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

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

a) A pump driven by an electric motor lifts 1.5 m^3 of water per minute to a height of 40 m. The pump has an efficiency of 90% and motor has an efficiency of 85%. Determine: (a) the power input to the motor. (b) The current taken from 480 V supply. (c) The electric energy consumed when motor runs at this load for 4 hours. Assume mass of 1 m^3 of water to be 1000 kg. [5]

b) A 3 tonne 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 a 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. (c) the cost of energy for a run of 48 km, taking energy charge as 40 paise/kWh. [5]

c) A factory has a 240V supply from which the following loads as (a) Lighting: 300 lamps of 150W, 400 lamps of 100W, 500 lamps of 60W lamps, lighting load is for 4 hours/day, (b) Heating: 100kW for 10 hours/day, (c) Motors: 44.76kW with efficiency of 75% for 2 hours/day, (d) Miscellaneous: Various load taking a current of 40 A for 2 hours/day. Calculate the weekly consumption of the factory in kWh when working on a 5 days week. What current is taken when the lighting load only is switched on? [5]

d) Three inductive coils each having resistance of 16 Ω and reactance of 12 Ω are connected in star across a 400 V, three-phase, 50 Hz supply. Calculate : i) Phase voltage ii) Line current iii) Phase current iv) Power factor v) Total Power consumed [5]