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

G.R. No.	

PAPER CODE	U111-203A

DECEMBER 2021 (INSEM+ ENDSEM) EXAM

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

COURSE NAME: BASIC ELECTRICAL ENGINEERING

COURSE CODE: ET10203A

(PATTERN 2020)

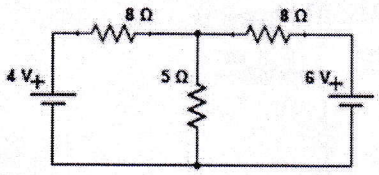
Time: [2Hr] [Max. Marks: 60]

(*) Instructions to candidates:

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

Q.1 **Solve the following**

i) For a given network as shown below, considering 5 Ω as a load resistance, the value of R_{eq} using Thevenin's theorem is [2]



a) 2 Ω b) 4.5 Ω

c) 1.5 Ω d) 4 Ω

ii) If two resistances R1 and R2 are connected in parallel across a voltage source VT and total current of circuit is IT, then current I2 in resistance R2 using current division rule is given by following formula [2]

a) $I_2=V_T \times [R_2/(R_1+R_2)]$ b) $I_2= I_T \times [R_2/(R_1+R_2)]$

c) $I_2= I_T \times [R_1/(R_1+R_2)]$ d) $I_2= V_T \times [R_1/(R_1+R_2)]$

iii) The load current IL in a load resistance RL using Norton's theorem is given by following formula [2]

a) $I_L= V_N \times R_N / (R_N+ R_L)$ b) $I_L= V_N / (R_N+ R_L)$

c) $I_L= I_N \times R_N / (R_N+ R_L)$ d) $I_L= I_N \times R_L / (R_N+ R_L)$

iv) In regard to Kirchhoff's Voltage Law (KVL) and concept of loop and circuit, following statement is true: [2]

a) A loop may contain different circuits and KVL can be applied only to a loop

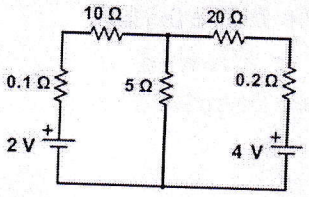
b) A circuit may contain different loops and KVL can be applied

only to a circuit
c) A circuit may contain different loops and KVL can be applied only to a loop
d) A loop may contain different circuits and KVL can be applied only to a circuit

v) If Thevenin resistance Req is 1 Ω and Thevenin voltage VTh is 24 V then load current IL flowing through load resistance RL of 5 Ω is [2]

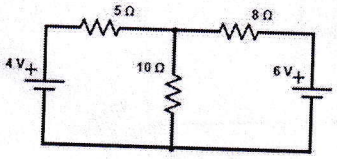
a) 2 A
b) 6 A
c) 1 A
d) 4 A

vi) For given electric circuit below, consider 5 Ω as load resistance. Applying Norton's Theorem to given electric circuit, Norton's Current i.e., Norton's short circuit current (IN or ISC) and Norton's equivalent resistance RN are respectively [2]



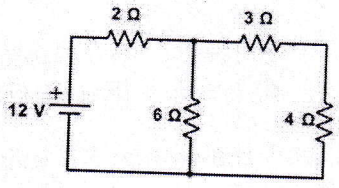
a) 0.396 A, 4.233 Ω
b) 0.396 A, 6.733 Ω
c) 0.126 A, 8.788 Ω
d) 0.246 A, 8.788 Ω

vii) For given electric circuit below, current flowing through resistance of 5 Ω using Kirchhoff's laws is [2]



a) 0.0706 A
b) 0.0231 A
c) 0.0511 A
d) 0.0921 A

viii) For the given circuit below, current flowing through resistance of 4 Ω using Superposition theorem is [2]



a) 2 A
b) 2.25 A
c) 1 A
d) Superposition theorem not applicable to this circuit

ix) If R = 10 Ω and XL= 25 Ω then the impedance in rectangular form can be expressed as [2]

a) (10 - j25) Ω
b) (10 + j25) Ω
c) (10 - j5) Ω
d) (10 + j15) Ω

a) (10 - j25) Ω b) (10 + j25) Ω
c) (10 - j5) Ω d) (10 + j15) Ω [2]

x) A coil has a resistance of 10 Ω and inductance of 0.06 H. The supply voltage is 150 Volts, 50 Hz. The active power consumed by the coil will be
a) 694.24 W b) 694.24 VAR
c) 494.24 W d) 494.24 VA [2]

xi) A series circuit consisting of a resistance of 100 Ω and a capacitance of 50 μF is connected across a 230 V, 50 Hz ac supply. The circuit impedance will be
a) 128.54 Ω *b)* 118.54 Ω
c) 125.66 Ω *d)* 130 Ω [2]

xii) A coil has a resistance of 10 Ω and reactance as 25 Ω connected across 230 V ac supply. The power factor of circuit is
a) 0.928 lag b) 0.561 lead
c) 0.371 lag d) 0.371 lead [2]

xiii) A circuit draws a current of 10 Amps at a 0.8 lagging pf. when connected across a voltage source of 200 V. The reactive power will be
a) 1600 VAR b) 1400 VAR
c) 1200 VAR d) 1000 VAR [2]

xiv) If V1= 4+j3 and V2= 5+j6, the product V1 × V2 in volts as expressed in polar form will be
a) 0.64 < -13.32 b) 39.05 < 87.06
c) 7.81 < 50.19 d) 7.81 <- 50.19 [2]

xv) Comment on following statements:
1. For a given combination of 'L' and 'C', there is only one resonance frequency 'fr'.
2. There is only one combination of 'L' and 'C' possible for any specified resonance frequency 'fr'.
a) Statement 1 and 2 both are true.
b) Statement 1 and 2 both are false.
c) Statement 1 is true but statement 2 is false.
d) Statement 2 is true but statement 1 is false.

Q2 **Solve any three out of four**

a) A 40 kVA, 2200V/220V, 50 Hz, 1-phase transformer has an iron loss of 250 W. The resistances of low and high voltage windings are 0.005 Ω and 0.5 Ω respectively. Calculate efficiency at full load and load power factor of 0.8 lagging. [5]

b) 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 [5]

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.

c) A single phase 100 kVA, 1000 V/250 V, 50 Hz transformer has an iron loss of 1 kW. The copper loss when primary carries current of 50 A is 500 W. Determine: - i) area of cross section of the limb if the flux density in the core is 0.9 Tesla and 1000 turns on primary side ii) primary and secondary side full load current iii) the efficiency at full load and 0.8 power factor lagging. [5]

d) A transformer is rated at 90 KVA, at full load its copper losses are 1100W and its iron losses are 950 W. Calculate: [5]
i. Efficiency at full load, unity power factor
ii. Efficiency at 60% of full load, 0.8 power factor

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

a) An electric pump lifts 64m^3 of water per hour to a height of 20 m. If its overall efficiency is 80 %, find the input power of motor. If the pump is used for 2 hours a day, find the daily cost of energy at the rate of Rs. 3/- per unit. [5]

b) A 1500V dc locomotive draws a load of 1200-tonne of mass at 40 km per hour. The tractive resistance of the load is 50 N/ tonne and system efficiency is 80 %, calculate the current drawn by the locomotive when the train travels along a level track. [5]

c) In a residential flat, following is the usage of various electrical appliances during a day. [5]
i. 4 fluorescent tubes each of 20 W for 5 hours
ii. 1.5 kW electric geyser for 1 hour
iii. 5 ceiling fans each of 53 W for 6 hours
iv. 800 W electric iron for 45 minutes
v. Other miscellaneous load of 600 W for 3 hours
Estimate the monthly electricity bill for this residential flat for a month of 28 days at the rate of Rs. 3/- per unit.

d) A delta- connected load draws a line current of 15 amperes at a lagging power factor of 0.85 from a 400 V, 50 Hz, 3-phase supply. Find the resistance and inductance of each phase. [5]