Total No. of Questions – [4]

Total No. of Printed Pages: 4

G.R. No.	

PAPER CODE	U112-203A(BE)

DEC 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:

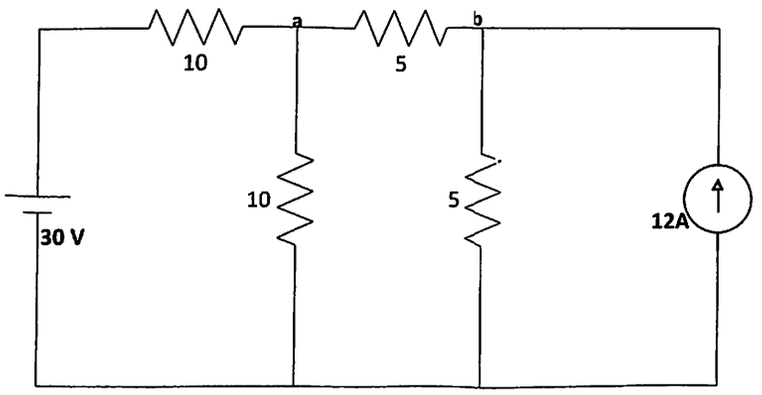
1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data where ever required**

Q.1 **Solve the following**

i) The time constant of an R-C circuit is defined as the time during which capacitor charging voltage actually rises to ----------percent of its ---------- value. [2]

(A) 37, initial (B) 37, final (C) 63.2, initial (D) 63.2, final

ii) The current flowing through branch ab is _____when 12 A current source acts alone for the circuit shown in figure below. [2]



(A) 6 A (B) 4 A (C) 12 A (D) 0

iii) While applying Norton's Theorem to a given network, the equivalent resistance is obtained by_____ [2]

(A) Shorting all voltage sources

(B) Opening all current sources

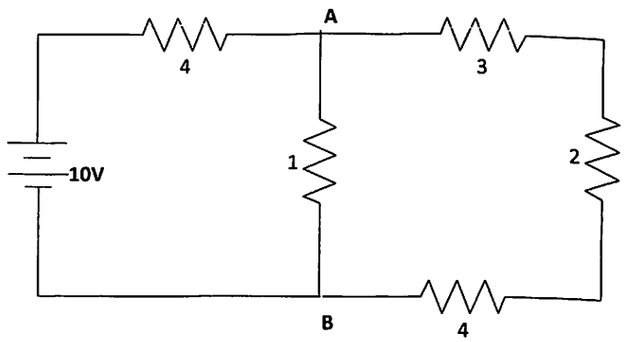
(C) Shorting all voltage sources and opening all current sources

(D) Opening all voltage sources and shorting all current sources

iv) In the application of Superposition Theorem to a given network, a voltage source is considered acting independently while the current source in the network is _____ [2]

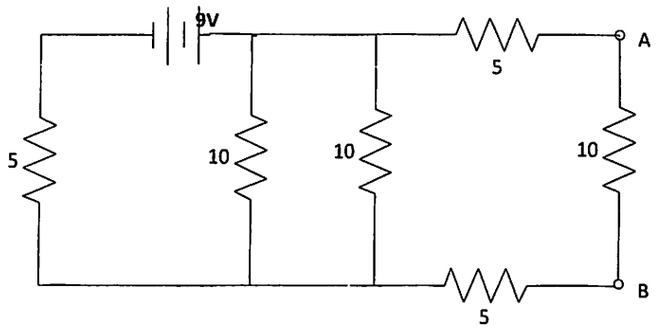
(A) shorted (B) opened (C) removed (D) undisturbed

v) What is the current carried by branch AB for the circuit shown in figure below? All resistance values are in Ω. [2]



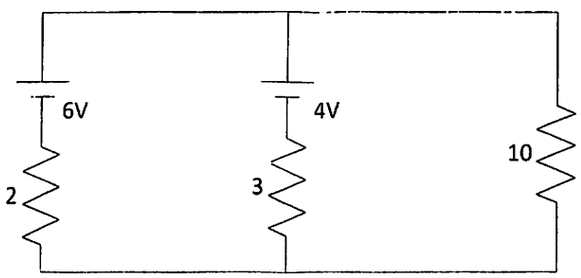
(A) 2.04 A (B) 1.84 A (C) 0.714 A (D) 10 A

vi) What is the value of equivalent resistance observed when terminals A and B are open circuited and 9V source is shorted in case of the circuit shown in figure below? All resistance values are in Ω. [2]



(A) 10 Ω (B) 12.5 Ω (C) 15 Ω (D) 20 Ω

vii) What is the value of Thevenin's Voltage when 10 Ω is opened as a load resistance in case of the circuit shown in figure below? All resistance values are in Ω. [2]



(A) 10 V (B) 2 V (C) 5.2 V (D) 4.8 V

viii) A 20 mF capacitor is in series with a 150 Ohm resistor. The combination is placed across a 40 V dc source. Time constant of the circuit is------- [2]

(A) 0.3 S (B) 3 S (C) 30 S (D) 3000 S

ix) The rms value of a sinusoidal ac current is equal to its instantaneous value at an angle of _____degrees. [2]

(A) 30 (B) 45 (C) 60 (D) 90

x) The voltage in a circuit is given as v=100 $sin\omega t$. If the frequency is 25 Hz, how long will it take for the voltage to rise to 50V? [2]

(A) 20 mS (B) 10 mS (C) 3.33 mS (D) 1.66 mS

xi) The two quantities are said to be in phase with each other when [2]

(A) the phase difference between two quantities is zero degree

(B) each of them pass through zero values at the same instant and rise in the same direction

(C) each of them pass through zero values at the same instant but rises in the opposite directions

(D) Both A and B

xii) The rms value of a sinusoidal AC current of maximum value 10A equals to a DC current of _____A. [2]

(A) 10 (B) 5 (C) 7.07 (D) 6.36

xiii) The voltage and current in the circuit are given as $V = 150\angle 30^\circ$ and $I = 2\angle -15^\circ$. If the circuit works at 50 Hz, find power factor. [2]

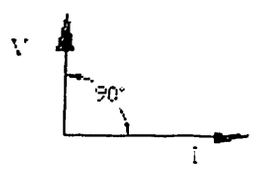
(A) 0.866 lead (B) 0.965 lag (C) 0.707 lag (D) 0.707 lead

xiv) An alternating voltage of 25 Hz frequency and 100 V maximum value is given by_____ [2]

(A) $v = 200\sin 628t$ (B) $v = 100\sin 314t$

(C) $v = 100\sqrt{2}\sin 314t$ (D) $v = 100\sin 157t$

xv) The phasor diagram for a certain circuit is as shown in figure below. Identify the nature of circuit. [2]



(A) pure resistance (B) pure inductance

(C) pure capacitance (D) pure capacitance and pure inductance

Q2 **Solve any three out of four**

a) Discuss the development of equivalent circuit of transformer and hence draw the exact equivalent circuit. [5]

b) What is an autotransformer? Write any two advantages, limitations and applications of an autotransformer. [5]

c) A single phase transformer working at unity power factor supplies full load output of 500 Watt. It has efficiency of 90% at half load as well as full load. Determine the efficiency at 75% of full load. [5]

d) A 100 KVA, 50Hz, 440V/1100V, 1-ph transformer has an efficiency of 98.5% when supplying full load current at 0.8 lagging power factor and efficiency of 99% when supplying half the full load current at unity power factor. Find the core losses and copper losses corresponding to full load current. [5]

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

a) Derive the relationship between the line current and phase current, line voltage and phase voltage for a 3 phase delta connected balanced load. [5]

b) The electrical installation in a house is utilized as mentioned below: [5]
   i) 5 Tube lights, 18W each, for 12 hrs a day
   ii) 3 ceiling fans, 60W each, for 10 hrs a day
   iii) 2 electric ovens, 1.2 KW each, for 3 hrs a day
   iv) 2 electric geysers, 1.5 KW each for 1.5 hrs a day.
   Calculate the total cost of energy at a rate of Rs.5 per unit for 30 days.

c) 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 (i) the output of the motor (ii) the current taken by motor if it gets power from a 220 V source. [5]

d) Three 100Ω resistances are connected in i) Star ii) Delta across 400V, 50Hz, 3-ph supply. Calculate power consumed by the load in each case. [5]