Dec.-23-1207

EE-111 (Basic Electrical Engineering) (Group-A)

B.Tech. 1st (CBCS/NEP)

(Common for all Branches)

Time : 3 Hours   Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt Five questions in all, selecting one question each from section A, B, C and D. Section E is Compulsory.

SECTION - A

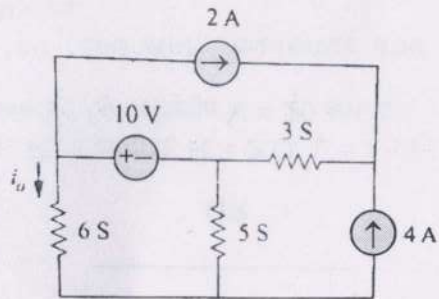1. Apply nodal analysis to find i_0 and the power dissipated in each resistor in the circuit of below Figure 1.   (10)

Figure 1

OR

2. Determine R_{Th} and V_{Th} at terminals 1-2 of circuit given in Figure 2. Find its equivalent Norton's circuit.   (10)
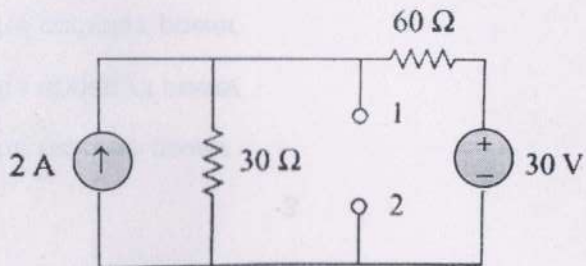

Figure 2

SECTION - B

3. For an R-C series circuit, a D.C voltage is applied at t=0. Find the expression for transient voltage at any time t.   (10)

OR

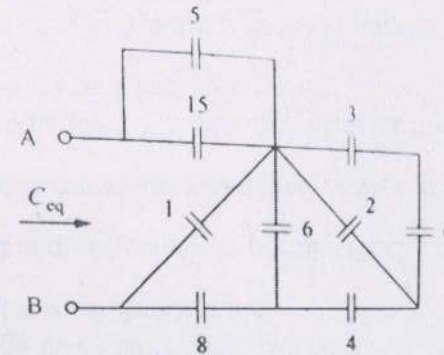4. (i)   Find the equivalent capacitance seen at the terminal A & B in the below Figure 3.   (5)

Figure 3

(ii) The switch in the circuit of Figure 4 has been closed for a long time. At t = 0, the switch is opened. Calculate i(t) for t > 0.   (5)
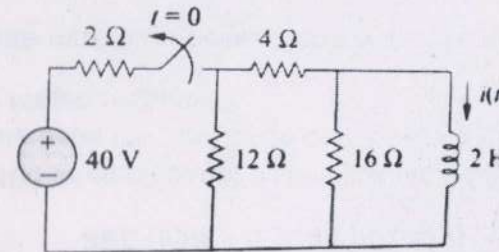

Figure 4

SECTION - C

5. In the below circuit given in Figure 5 calculate:-

(a)   the power factor

(b)   the average power delivered by the source   [P.T.O.]

(c)   the reactive power

(d)   the apparent power
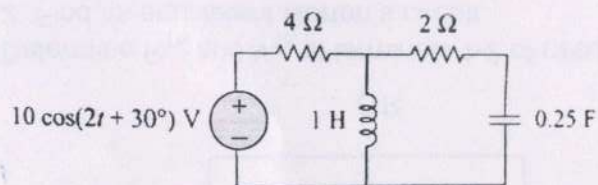
(e)   the complex power   (5×2=10)

Figure 5

OR

6.   In the series RLC circuit, R = 2 Ω, L = 1 mH, and C = 0.4 μF and it is powered by voltage V = 20 sinωt.

(a)   Find the resonant frequency and the half-power frequencies.

(b)   Calculate the quality factor and bandwidth.

(c)   Determine the amplitude of the current at ω_0, ω_1, and ω_2.

(10)

SECTION - D

7.   (i)   Derive EMF equation of a single phase transformer.   (5)

(ii)   A single phase transformer has 180 and 90 turns respectively in its secondary and primary windings. The respective resistances are 0.233Ω and 0.067Ω. Calculate the equivalent resistance of a) primary in terms of secondary b) secondary in terms of primary c) total resistance of the transformer in terms of the primary.

(5)

OR

8.   (i)   Derive torque equation of motor.   (5)

(ii)   A four-pole, 500V, wave-wound DC shunt motor has 900 conductors on its armature. Calculate the speed of the motor if its armature current is 80A. The flux per pole is 21mWb and the armature resistance is 0.1Ω.   (5)

SECTION - E (Compulsory)

9.   (a)   A 100 W electric light bulb is connected to a 250V supply. Determine the resistance of the bulb. What do you mean by forced response?

(b)   State maximum power transfer theorem.

(c)   The voltage across a 6-μF capacitor is V(t) =20 cos 3000t V. Calculate the current through it.

(d)   Let a RL series circuit is switch on at t=0 with a DC source voltage of V=230V. What will be the current flowing through it at t = ∞, if R=10 ohms.

(e)   What is quality factor in parallel RLC circuit at resonance?

(f)   What is meaning of reactive power in AC circuit?

(g)   In a balanced Δ-Δ system, what is the relation between phase current and line current.

(h)   What do you mean by time constant?

(i)   What are the parameters represented by Fleming's left-hand rule used in DC motor?

(j)   When the turns ratio of a transformer is 20 and the primary AC voltage is 12 V, calculate the secondary voltage.

(10×2=20)