DEHRADUN INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ELECTRICAL ENGINEERING

Assignment:-1

EA1210-Introduction to Electrical Engineering-Unit 1

Note: - All resistances are in ohm (Ω)

Q1. Using Node Analysis, determine current in each branch of the network in fig 1. Also find total power loss in the network..

(Ans: - 0.6 A, 0.3 A, 0.4 A, 0.2 A, 0.6 A, 15 Watts)

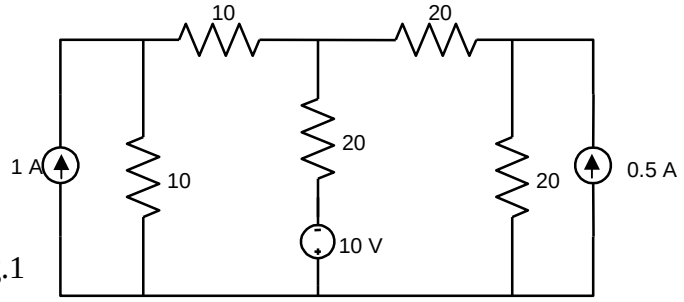

Fig.1

Q2. A Wheatstone bridge ABCD has the following details: AB= 10 Ω BC = 30 Ω CD = 15 Ω & DA = 20 Ω. A battery of e.m.f. 2 V and negligible internal resistance is connected between A & C with A positive. A galvanometer of 40 ohm resistance is connected between B & D. Determine the magnitude and direction of current in the galvanometer using Thevenin's theorem.
(Ans: - R_{Th} = 16.07 Ω , V_{Th} = 0.642 V, 11.5 mA from B to D)

Q3. Find the current in 10 Ω resistor using (Fig. 2)

(i) Superposition Theorem
(ii)Thevenin's Theorem
(ii) Norton's Theorem

(Ans: - R_{Th} = 5.35 Ω, V_{Th} = 7 V, 0.46A)

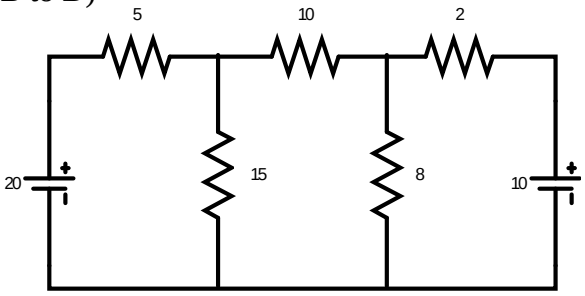

Fig. 2

Q4. Find the current in 3 Ω resistor using (Fig. 3)

(i) Superposition Theorem
(ii) Thevenin's Theorem
(iii)Norton's Theorem

(Ans: - 1 A)

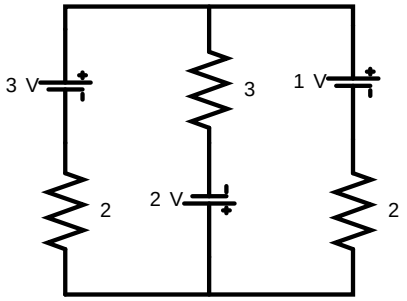

Fig. 3

Q5. Obtain the essential condition for maximum power transfer to the load R_L , and hence determine the maximum power transferred. (Fig.4)
(Ans: - R_{Th} = R_L = 4..3 Ω, 5.8 W)

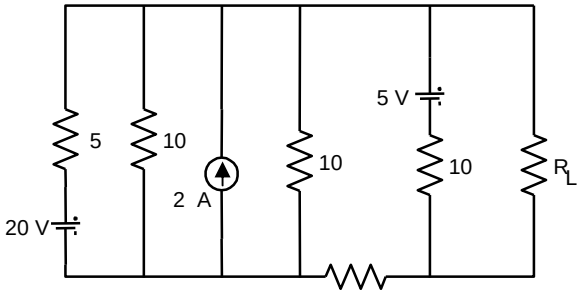

Fig. 4

Note: - All resistances are in ohm (Ω)

Q6. Find the current in 2 Ω connected between A & B resistor using (Fig. 5)
(i) Superposition Theorem
(ii) Thevenin's Theorem
(iii) Norton's Theorem
(Ans: - 1.36 A)

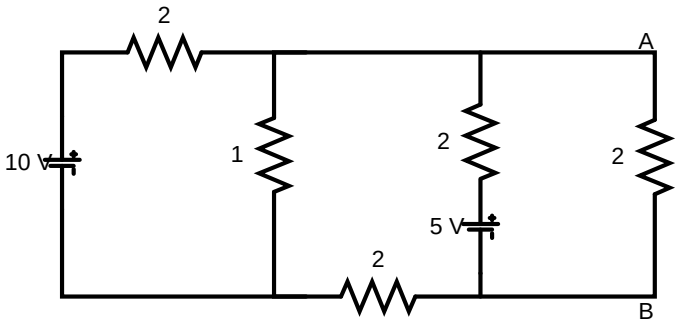

Fig. 5

Q7. At P-Q find (fig 6)
(i) Thevenin's Equivalent circuit
(ii) Norton's Equivalent circuit
(Ans: - R_{Th} = 7 Ω, V_{Th} = 72 V, 7 Ω, I_N = 10.29 A)

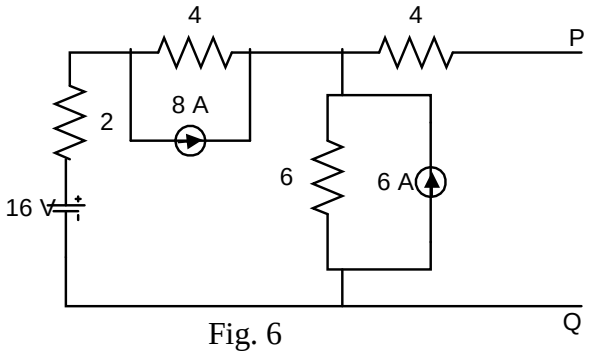

Fig. 6

Q8. At P-Q find (fig 7)
(i) Thevenin's Equivalent circuit
(ii) Norton's Equivalent circuit
(Ans: - R_{Th} = 3.33 Ω, V_{Th} = 10 V,
R_N = 3.33 Ω, I_N = 3.03 A)

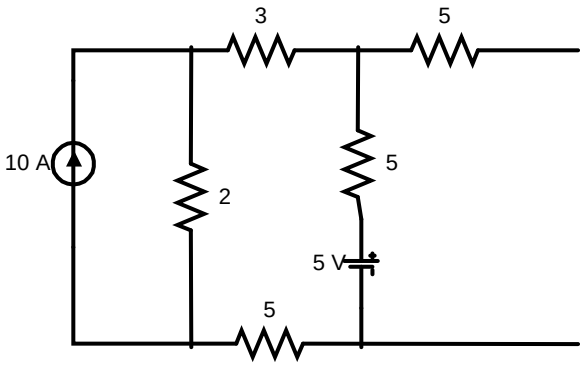

Fig. 7

Note: - All resistances are in ohm (Ω)

Q9. Find resistance between P-Q (fig 8) and A-B (fig 9)

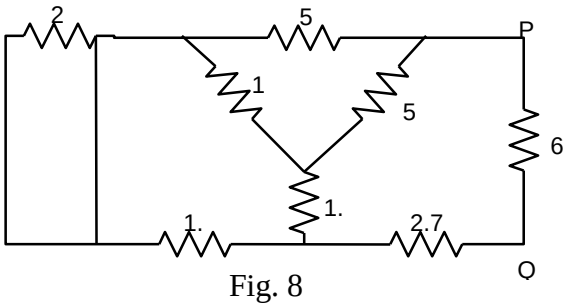

Fig. 8

(Ans: - 3 Ω)

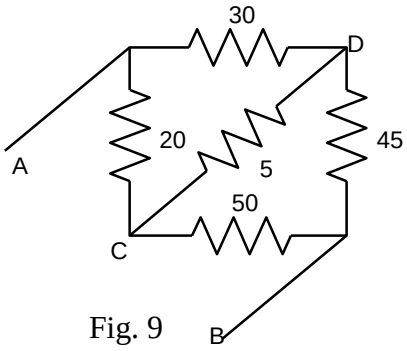

Fig. 9

(Ans: - 36 Ω)

Q10. What are the similarities and dissimilarities between electrical and magnetic circuits?

Q11. An iron ring having a mean diameter of 25 cm and cross – section area 2 cm^2 is uniformly wound with 400 turns and carries a current of 5 A. The permeability of iron is 450. Calculate (i) magneto motive force (ii) reluctance (iii) flux and (iv) flux density produced.
(Ans.:- 2000 AT, 0.694 X 10^7 AT/Wb, 0.288 mWb , 1.44 T)

Q12. A rectangular magnetic core shown in fig. 10 has square cross – section of area 16 cm2. An air gap of 2 mm is cut across one of its limbs. Find the exciting current needed in the coil having 1000 turns wound on the core to create an air gap flux of 4 mWb The relative permeability of the core is 2000. (Ans.:- 4.713 A)

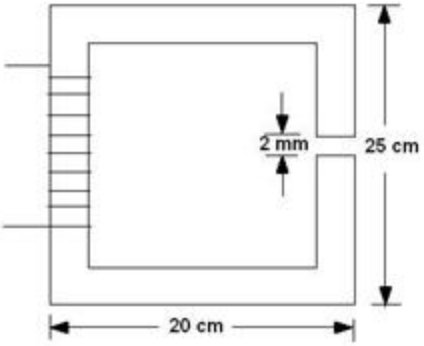

Fig. 10

Q18. A cast steel magnetic structure made of a bar of section 2 cm X 2 cm is shown in fig. 11. Determine the current that the 500 turn magnetizing coil on the left limb should carry so that a flux of 2 mWb is produced in the right limb. Take μ_r = 600 and neglect leakage. (Ans.:- 12.148 A)

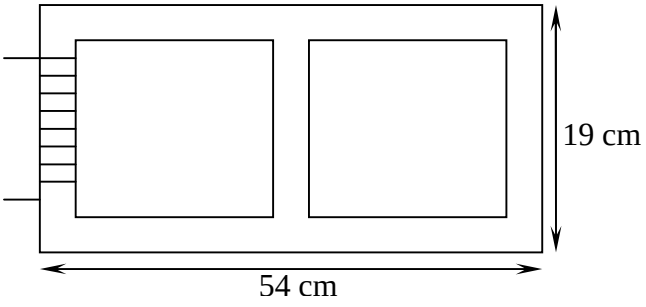

Fig. 11