



Thapar Institute of Engineering and Technology (Deemed to be University)  
DEPARTMENT OF ELECTRICAL AND INSTRUMENTATION ENGINEERING

## TUTORIAL 1 (BASIC LAWS)

UES 013 ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR (CSE)

Course Instructor: Dr. Shakti Singh, Dr. Asim Aftab

1. Use the KVL and KCL method to find how much power the 20-V source extracts from the circuit in Fig (60W)

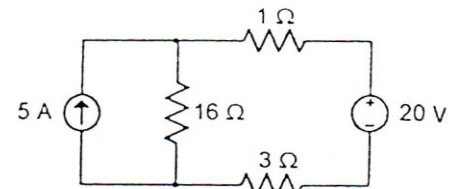


Figure 1

2. Referring to Figure 2
  - a. Using KVL and KCL, find the branch currents  $i_a$  through  $i_e$  in the circuit.
  - b. Find the total power developed in the circuit.
 (ans: a) 5.6 A, 0.6 A, 5 A, 0.2 A, 4.8 A      b) 2048 W

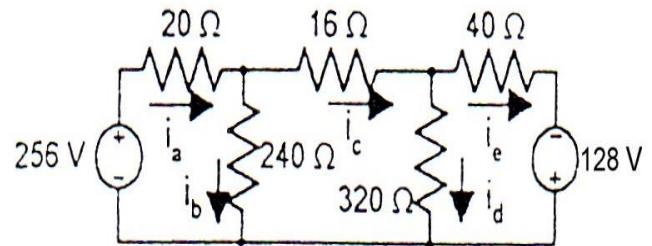


Figure 2

3. Using KCL and KVL Analysis, find  $v$  in Fig 3. (20 V)

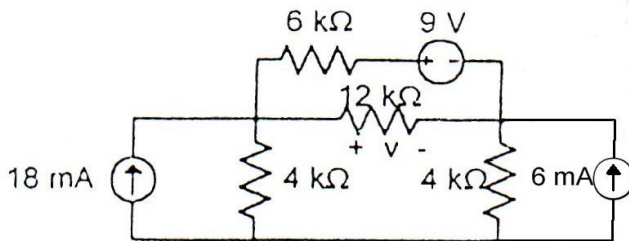


Figure 3

4. Find current in 100 ohms resistor in Figure 4, using KVL and KCL.

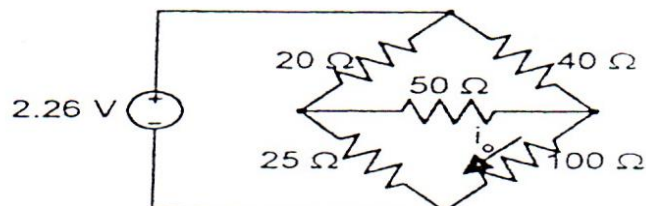


Figure 4



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## TUTORIAL 2 (NODAL & MESH ANALYSIS)

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FIRST YEAR (CSE)

Course Instructor: Dr. Shakti Singh, Dr. Asim Aftab

Q1. Use the node-voltage method to find how much power the 20-V source extracts from the circuit in Fig 1 (60W)

Q2. Use the node-voltage method to find  $v_1$  and  $v_2$  in Fig 2 (100 V, 50 V)

Q3. Use the node-voltage method to find the power delivered by the dependent voltage source in Fig 3. (Ans: -750W)

Q4. Find  $v$  and  $i$  in Fig 4 using Nodal Analysis.  
(ans : 0.46V, 2.23A )

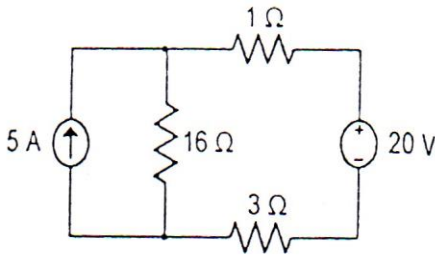


Figure 1

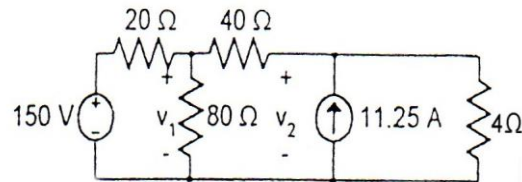


Figure 2

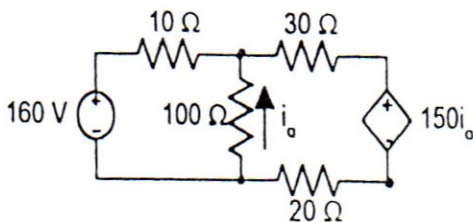


Figure 3

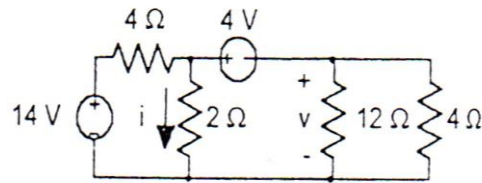


Figure 4

Q5. Using mesh analysis finds mesh currents in Figure 3 and 4.

Q6. Use Mesh analysis to find the power dissipated in the 1Ω resistor. (Ans: 36W)

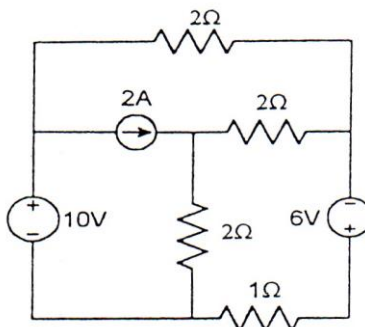


Figure 6



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### TUTORIAL 3, 4 (CIRCUIT THEOREMS)

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Course Instructor: Dr. Shakti Singh, Dr. Asim Aftab

#### Superposition

1. Using Superposition theorem (figure 1) , find the current  $I$  in  $16\Omega$ . (2A)
2. Using Superposition (Figure 2), find the voltage,  $V$ . (32 V)

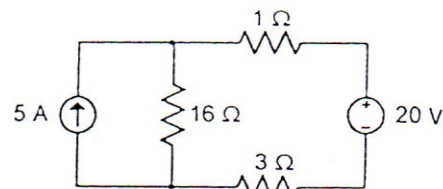


Figure 1

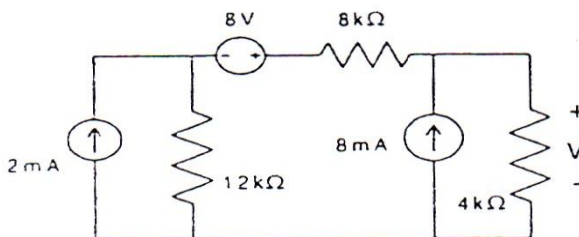


Figure 2

#### Thevenin Theorem

3. Find the Thevenin equivalent circuit with respect to terminal  $ab$  for figure 3. (60 V,  $10\Omega$ )

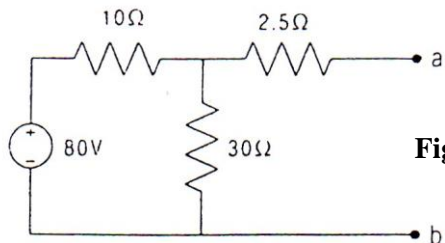


Figure 3

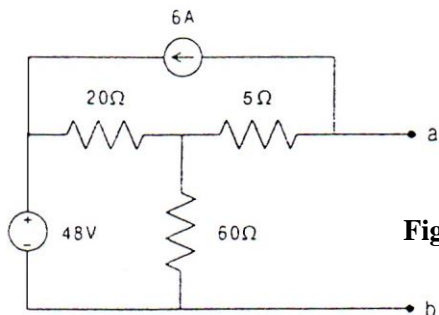
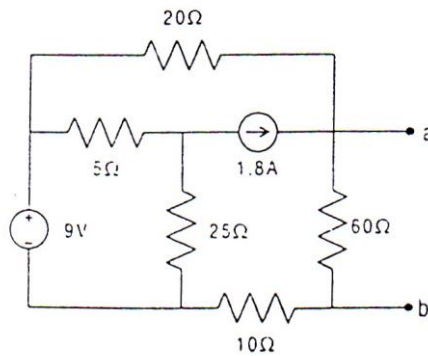


Figure 4

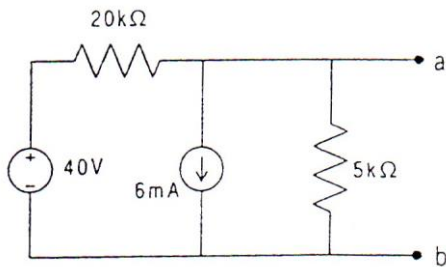
4. Find the Thevenin equivalent circuit with respect to terminal  $ab$  for figure 4. (-84 V,  $20\Omega$ )
5. Find the Thevenin equivalent circuit with respect to terminal  $ab$  for figure 5. (30 V,  $20\Omega$ )



**Figure 5**

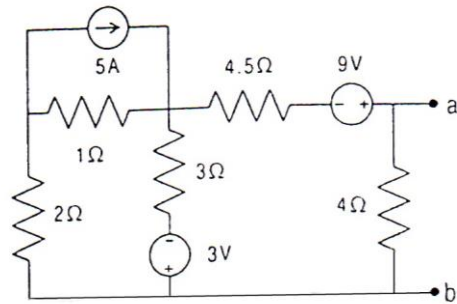
### Norton Theorem

6. Find the Norton equivalent circuit with respect to terminals ab for figure 6 . (- 4 mA, 4 kΩ)



**Figure 6**

7. Find the Norton equivalent circuit with ab for figure 7. (1.67 A, 2.4 Ω)

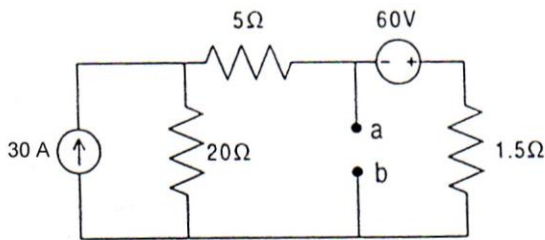


**Figure 7**

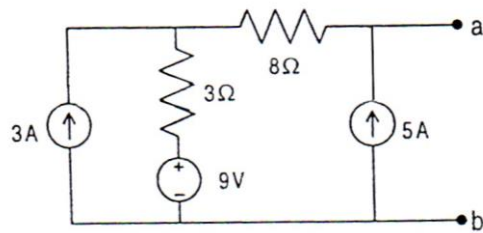
respect to terminals

### Source-Transformation (Thevenin & Norton)

8. Find the Thevenin and Norton equivalent for the network shown below.  
 ( (i) -22.65V, - 15.95A, 1.42 Ω (ii) 73 V, 6.64A, 11 Ω )  
 (i) (ii)



**Figure8(i)**



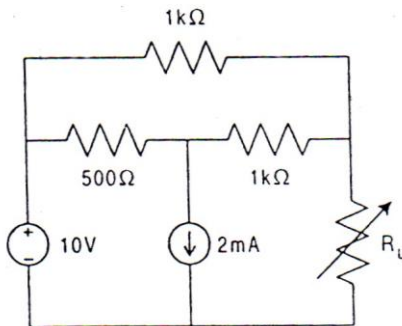
**Figure 8(ii)**

## Maximum Power Transfer

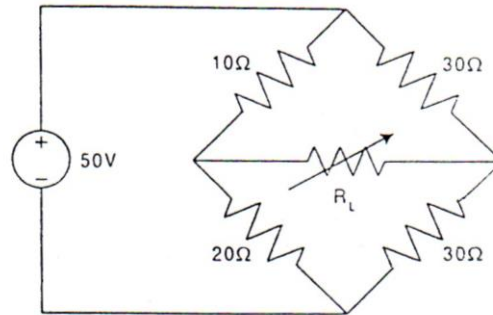
9. The load resistance in figure below is adjusted until maximum power is delivered. Find the power delivered and the value of  $R_L$ .

((i)  $600\ \Omega$ ,  $38.4\ \text{mW}$  (ii)  $21.7\ \Omega$ ,  $0.8\ \text{W}$ )

(i) (ii)



**Figure 9(i)**



**Figure 9(ii)**



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## TUTORIAL 5 (THEOREMS)

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1. Calculate the effective resistance between points A and B as given in Fig. 1. [Ans. 3.69  $\Omega$ ]
2. In the circuit shown in Fig. 2, calculate current through 1  $\Omega$  resistance connected between A-B, using Thevenin's theorem. Verify your answer using superposition theorem. [Ans. 14 A]
3. For the circuit shown in Fig. 3, find the voltage across 4  $\Omega$  resistance by source transformation. [Ans. 7.112 V]
4. Using superposition theorem, find the value of output voltage  $V_0$  in the circuit of Fig. 4. [Ans. 2 V]
5. Determine the Thevenin's equivalent circuit as viewed from the open-circuit terminals *a* and *b* of the network shown in Fig. 5. All resistances are in ohms. [Ans.  $V_{oc} = 3$  V,  $R_{TH} = 5$   $\Omega$ ]
6. Find  $i_0$  in the circuit of Fig. 6 using superposition theorem. [Ans.  $i_0 = -0.4706$  A]

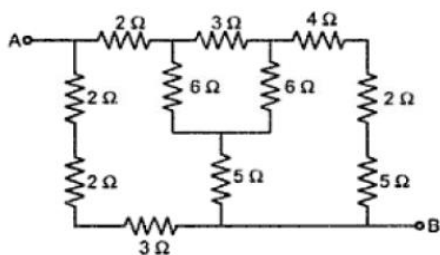


Fig. 1

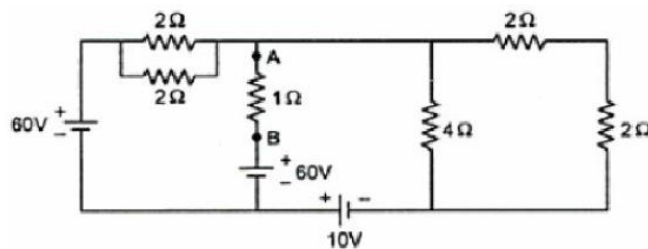


Fig. 2

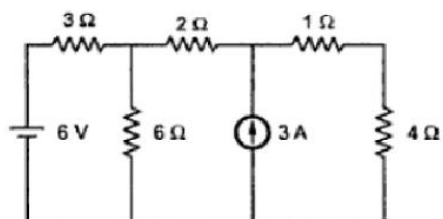


Fig. 3

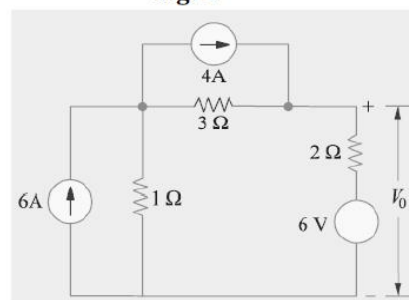


Fig. 4

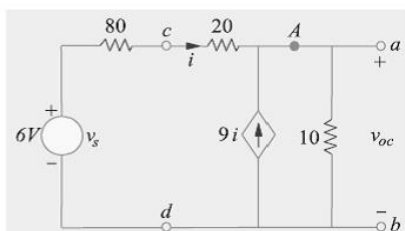


Fig. 5

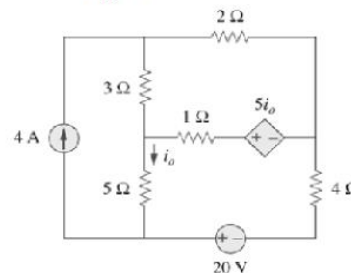


Fig. 6

