Tutorial 4

Thevenin's and Norton's Theorems

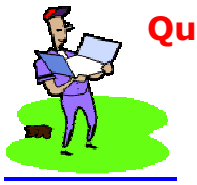
1. Obtain the Thevenin and Norton equivalent circuits between terminals AB for the active network shown in Figure 1.
   Ans: V_{TH} = 6.29 V with B +Ve, R_{TH} = 9.43 Ω, I_N = - 0.67 A, R_N = 9.43 Ω

2. For the circuit shown in Figure 2, find the current through the 8 Ω using the Thevenin and Norton equivalent circuits.
   Ans: V_{TH} = 4.27 V, R_{TH} = 2.69 Ω, I_N = 1.59 A, R_N = 2.69 Ω, $I_{8\Omega}$ = 0.4 A

3. Obtain the Thevenin equivalent and Norton equivalent by applying the respective theorems as seen across terminals AB of the circuit in Figure 3.
   Ans: $V_{TH} = 11.17 \angle -63.4°$ V, $Z_{TH} = 10.6 \angle 45°$ Ω, $I_N = 1.06 \angle -108.4°$ A,
   $Z_N = 10.6 \angle 45°$ Ω

4. For the circuit shown in Figure 4, apply Thevenin's and Norton's theorems to
   (a) Find the equivalent circuit parameters between the terminals A and B.
   (b) Calculate the voltage across the load R_L.
   Ans: $V_{AB} = V_{TH}$ = –5 V, R_{TH} = 15 Ω, $I_{AB} = I_N$ = –0.33 A, R_N = 15 Ω, V_{RL} = 2.22 V

5. For the circuit shown in Figure 5,
   (a) Applying Norton's theorem, find the Norton equivalent circuit parameters I_N and R_N at the terminals AB.
   (b) Using the Norton equivalent circuit obtained above calculate the current flowing and voltage across the load R_L.
   (c) Convert the Norton equivalent circuit to find its Thevenin equivalent circuit.
   Ans: I_N = 1.818 A, R_N = 5.5 Ω, I_{RL} = 1.33A, V_{RL} = 2.66 V, V_{TH} = 10 V, R_{TH} = 5.5 Ω



Quiz – 3 questions
(Thevenin's Theorem)
– 3 questions
(Norton's Theorem)

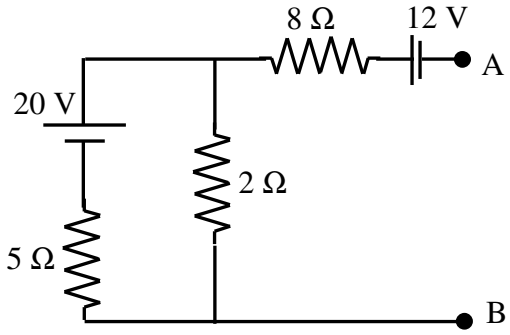


Figure 1

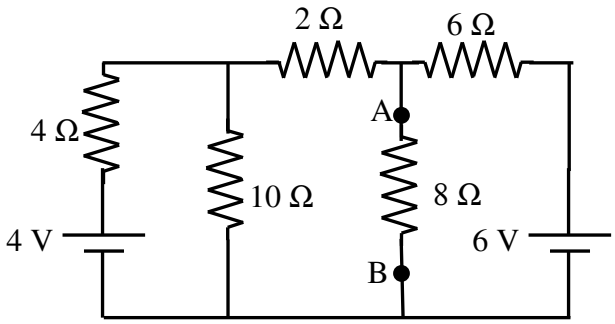


Figure 2

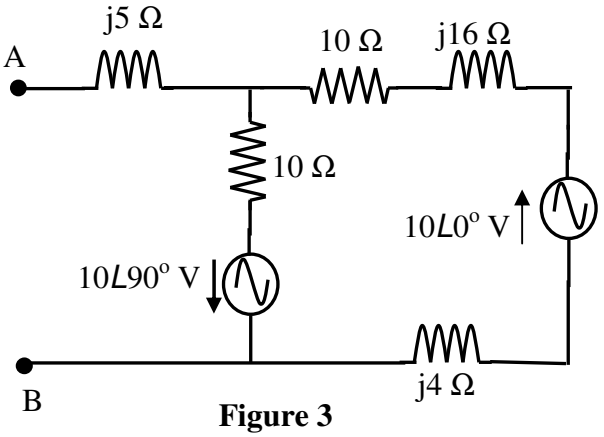


Figure 3

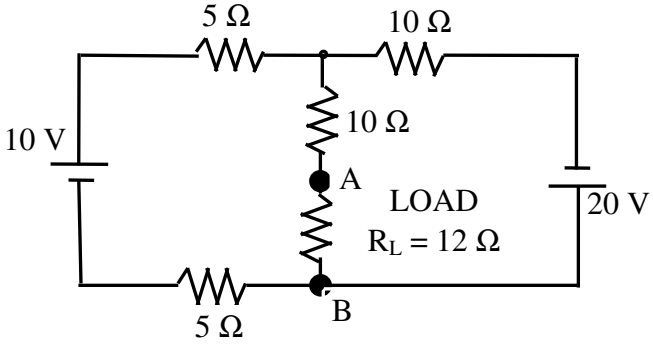


Figure 4

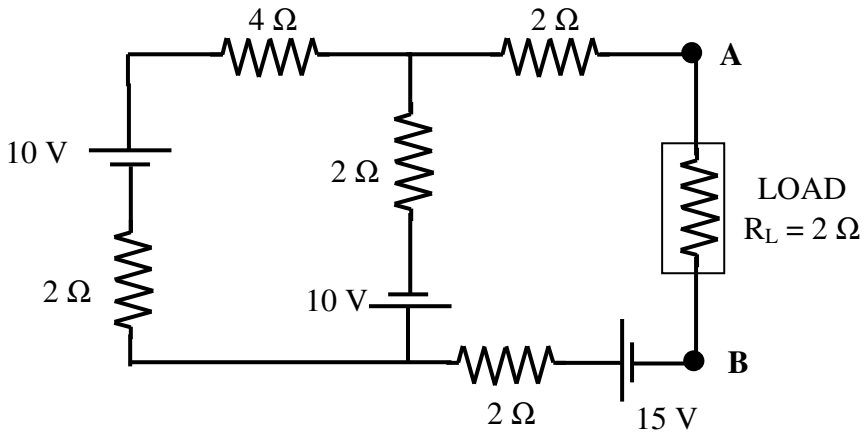


Figure 5