Introduction to Electrical Engg.
EE 103
Assignment – 4

Q1. Consider the circuit shown in Figure 1. Perform nodal analysis and hence determine V_A, V_B, V_C. Also determine the power delivered by the current source.

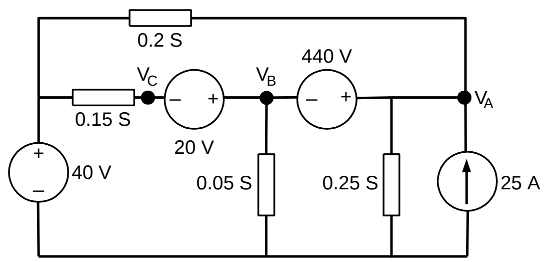


Figure 1

Q2. In the circuit shown in Figure 2, V_{s1}= -10 V, I_{s2} = 1 A, and all resistors are 10 Ω. Apply nodal analysis to determine V_A, V_B, V_C.

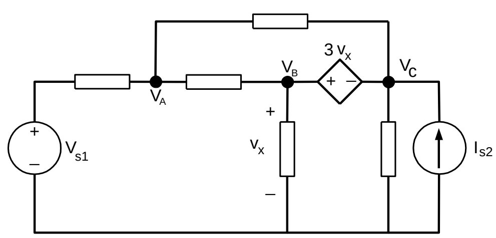


Figure 2

Q3. Consider the circuit shown in Figure 3 along with the defined loops 1, 2 and 3. Determine I_1, I_2, I_3 and hence determine, v.

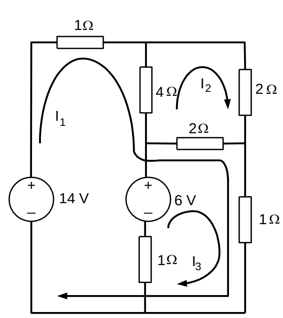


Figure 3

Q4. Consider the circuit shown in Figure 4, wherein V_{s1} = 250 V and I_{s2} = 0.75 A. Write two mesh equations and hence determine V_B.

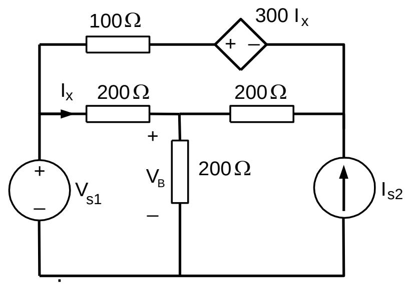


Figure 4

Q5. Consider the linear network of Figure 5. Two separate dc measurements are taken. In the first experiment it is found that when V_a = 7 V and I_b = 3 A, the load current is I_{load} = 3 A. In the second experiment it found that when V_a = 7 V and I_b = 1 A, then I_{load} = 3 A. Compute I_{load} when V_a = 15 V and I_b = 9 A.

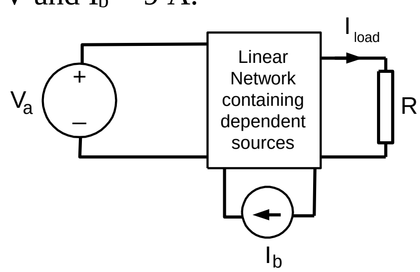


Figure 5

Q6. Find the Thevenin equivalent circuit of the network shown in Figure 6 as viewed from A - B

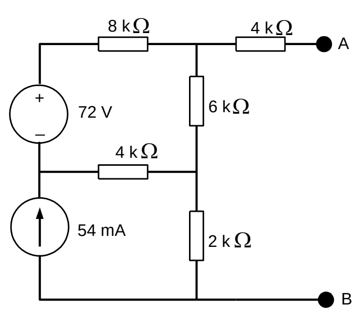


Figure 6

Q7. Find Thevenin equivalent of the circuit shown in Figure 7 as viewed from A – B. What is the Norton's equivalent?

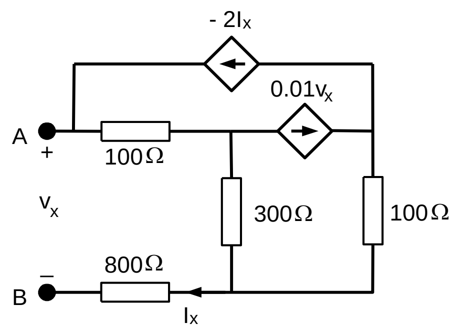


Figure 7

Q8. Find the Norton and Thevenin equivalent of the circuit shown in Figure 8.

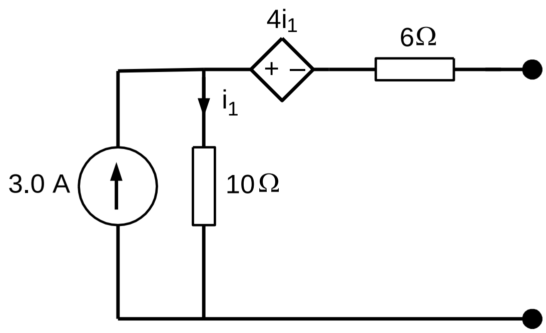


Figure 8

Q9. For the circuit shown in Figure 9, find the load resistance, R_L needed for maximum power transfer. Also determine the maximum power delivered to the load resistor, R_L.

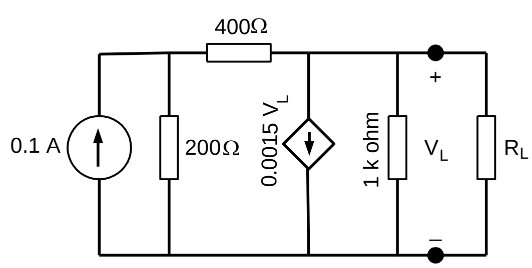
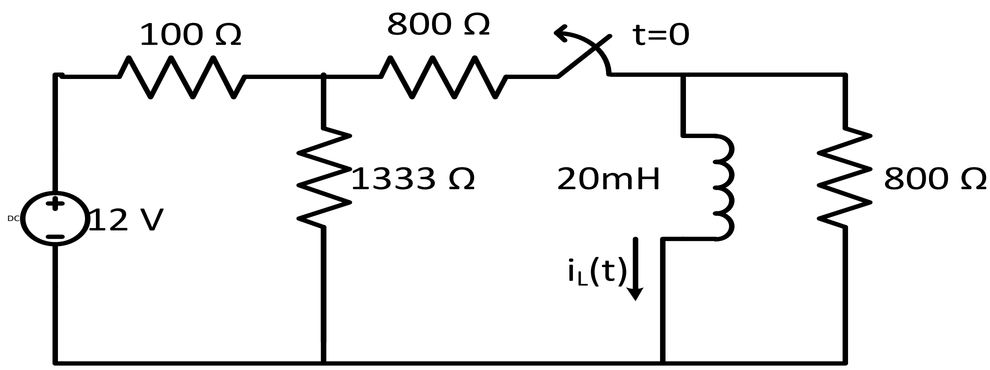


Figure 9

10) In the Figure the 12 V source has been applied for a long time before the switch opens at $t = 0$. Find $i_L(0^+)$ and $i_L(t)$ for $t > 0$. Sketch $i_L(t)$ for $0 \le t \le 5\tau$, where τ is the circuit time constant for $t > 0$.

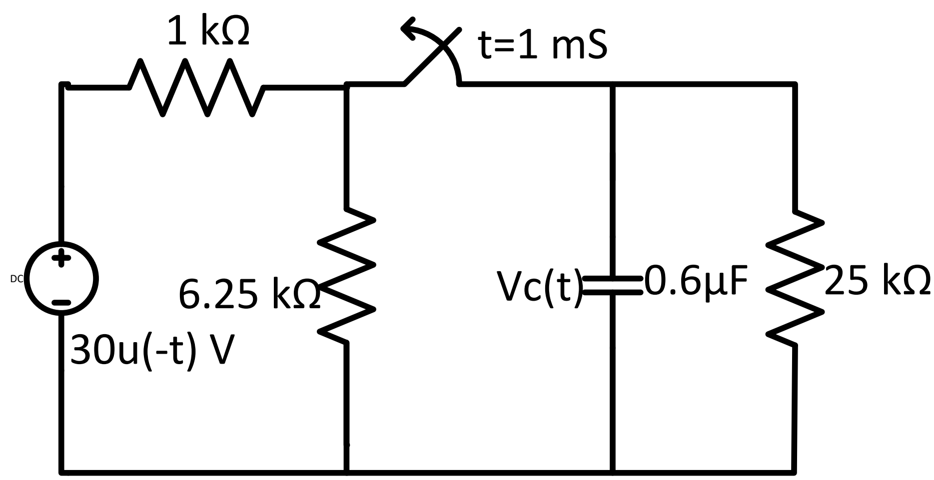


11) In the figure the 30 V source has been applied for a long time, and the switch is opened at t=1 ms.

(a) Find $v_c(0^+)$ and $v_c(t)$ for $0 < t < 1$ ms.

(b) Find $v_c(1^+\ \mathrm{ms})$ and $v_c(t)$ for $t \le 1$ ms.

(c) Find $v_c(t)$ for $0 \le t \le 25$ ms.



12) (a) For the circuit of Figure A find $v_c(t)$ for $t > 0$, assuming that the 80 V source has been applied for a very long time. Plot the response $v_c(t)$ for $0 \le t \le 0.25$ s.

(b) Consider now the circuit of Figure B. Find $v_c(t)$ for $t > 0$. Plot the response $v_c(t)$ for $0 \le t \le 0.25$ s.

(c) Compare the time constants of the circuit of part (a) and (b) for the intervals $0 \le t \le 60$ ms and $60\text{ms} \le t$.

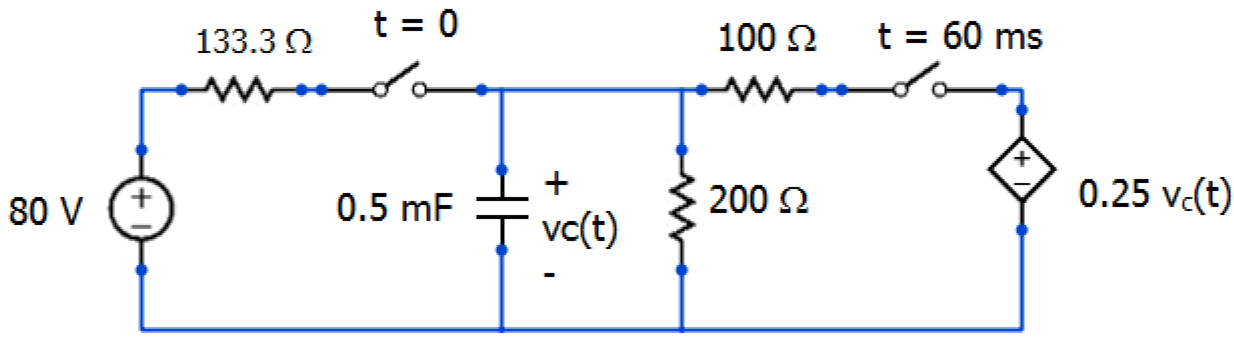


Figure A

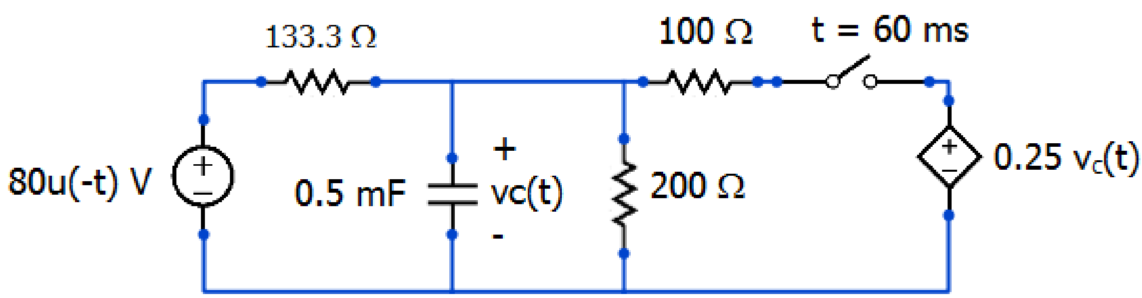


Figure B