Chapter 27-Circuits

Multi-Resistor Single Loop Circuits

Q1. A battery is connected to a resistor, and a current of 4.0 A exists in the circuit. When an additional 15-Ohm resistor is added to the circuit in series with the original resistor, the current drops to 1.0 A. What is the emf of the battery?Ans:20 Volts.
Q2. Three resistors, of resistance 2.0 Ohm, 4.0 Ohm and 6.0 Ohm, are connected to a 24 Volt battery as shown in figure (2). The power dissipated in the 2.0 Ohm resistor is: Ans:8 W.

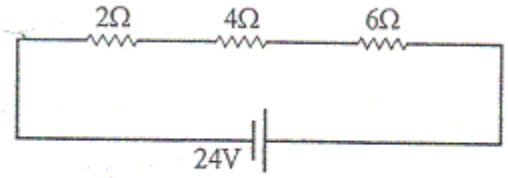

Figure (2)

Q3. An electrical source with internal resistance r = 2.0 Ohm is used to operate a lamp of resistance R = 18 Ohm. What fraction of the total power is delivered to the lamp?Ans:0.9.

Potential Difference

Q4. In Figure 4, if I = 1.5 A in the circuit segment shown, what is the potential difference V_b-V_a? Ans:-22 V

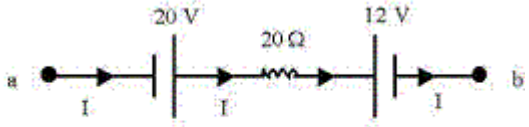

Figure 4

Q.5 In Figure 3, the current in the 3 ohms resistor is 4 A. The potential difference V_b - V_a is: Ans:-28 V

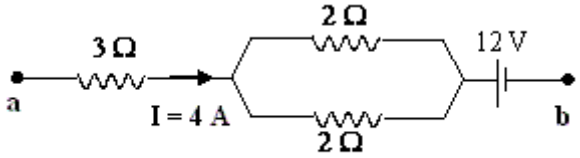

Figure 3

Q6. If the current I in figure (5) is equal to 4.0 A, then the potential difference between point 1 and 2, i.e. (V_2 - V_1), is: Ans:- 40 Volts.

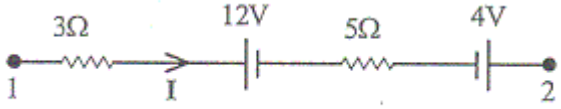

Figure (5)

Q7. In figure 5, the current in the 5.0-ohm resistor is 3.0 A. What is the potential difference V_a - V_b? Ans:+ 30 V

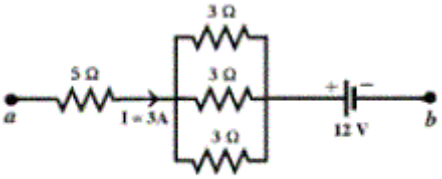

FIGURE 5

Q8. In figure 2, a battery of emf of 12-Volt and internal resistance of r = 3.0 Ohm is connected to a bulb of resistance R. If the bulb will light at a steady current of 0.1 A, what should the value of R be? Ans:117 Ohm.

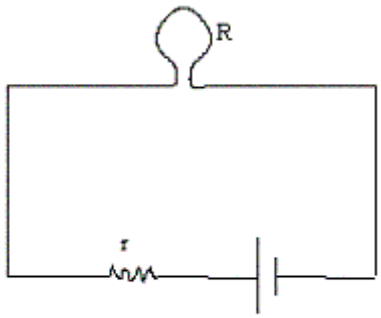

Figure 2

Multi-Loop Circuits

Q9. In figure (4) V=14 Volts, R_1=2-Ohm, R_2=10-Ohm, R_3=4-Ohm and R_4=6-Ohm. Find the current passing through R_1. Ans:2 A.

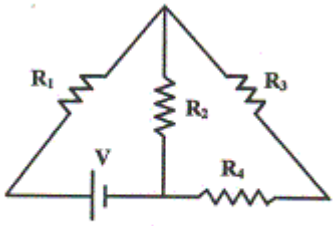

Figure # 4

Q10. In figure (1), find the magnitude and direction of the current passing through the 3 Ohm resistor.Ans:3 A, upwards.

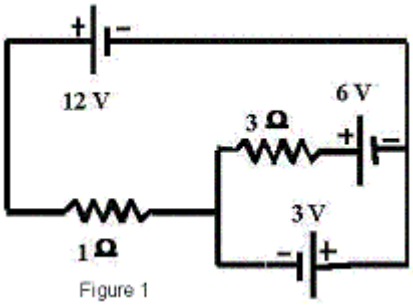

Figure 1

Q11. The equivalent resistance between terminals a and b in Figure (2) is 65 Ohm. Calculate the value of the resistor R. Ans:40 Ohms

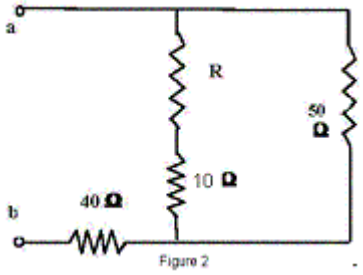

Figure 2

.

Q12. What is the power dissipated in the 3-Ohm resistor shown in Figure 3?Ans:27 W

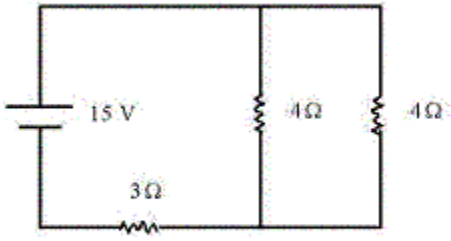

Figure 3

Q13. Find the value of R in the circuit shown in Figure 5. Ans:5 Ohms

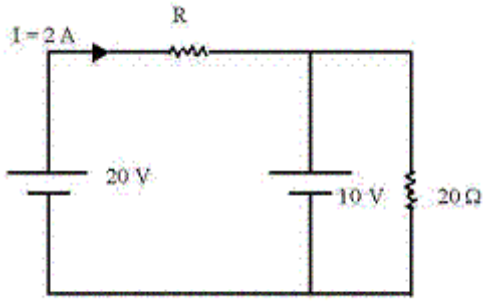

Figure 5

RC Circuits

Q14. A capacitor in an RC circuit is charged to 85% of its maximum value in 2.4 s. What is the time constant of this circuit?Ans:1.3 s

Q15. A 4.00 micro-F capacitor is charged to 24.0 V. Find the charge on the capacitor 4.00 milli-seconds after it is connected across a 200-Ohm resistor.Ans:0.647 micro-C

Q16. A certain capacitor (initially uncharged), is connected in in series with a resistor and a battery. After, being charged for 10 ms the charge on the capacitor is half of its maximum value. What is the time constant (RC) of the circuit?Ans:14.4 milli-s

Q17. How long will it take a charged capacitor of 50.0×10^{-6} F to loss 30% of its initial energy if allowed to discharge through a 40 Ohm resistor?Ans:0.36×10^{-3} s.

Q18. The capacitor in figure (1) is initially charged to 50 V and then the switch is closed. What charge flows out of the capacitor during the first minute after the switch was closed? Ans:4.8 mC.

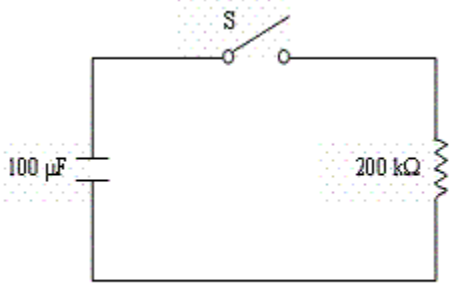

Figure 1

Q19. In the circuit shown in figure 3, the capacitor was initially uncharged. At time t = 0, switch S is closed. If T denotes the time constant, the current through the 3-ohm resistor at t = T/10 is Ans:0.90 A.

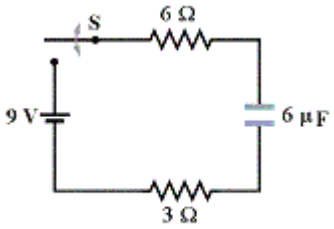

Figure 3

Q20. The circuit in Figure 3 has been connected for a long time. Find the potential difference $V_b - V_a$. Ans:8 V

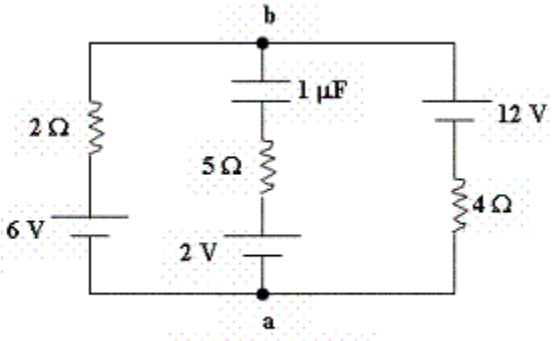

FIGURE 3