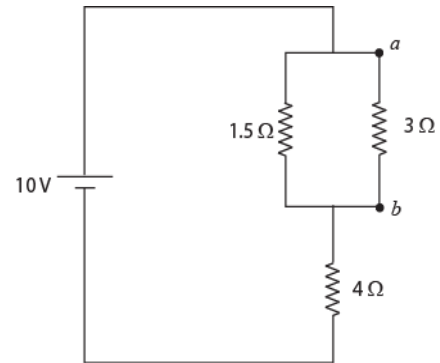


Old Exams-Chapter 27

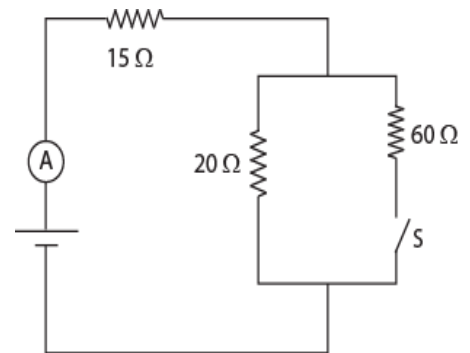
T081

Q1. Fig 1 shows two resistors $3.0\ \Omega$ and $1.5\ \Omega$ connected in parallel and the combination is connected in series to a $4.0\ \Omega$ resistor and a $10\ \text{V}$ emf device. The potential difference $V_a - V_b$ is: (Ans: $2.0\ \text{V}$)

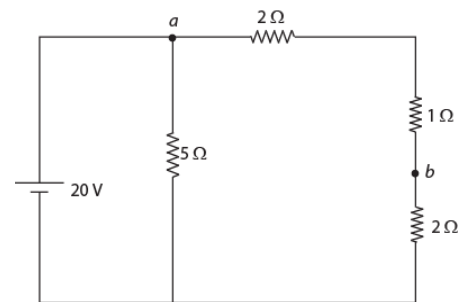


Q2. A certain capacitor, C , in series with a resistor, R , is being charged. At the end of $10\ \text{ms}$ its charge is half the maximum value. The time constant of the RC circuit is: (Ans: $14\ \text{ms}$)

Q3.: When switch S is open, the ammeter in the circuit shown in Fig 2 reads $2.0\ \text{A}$. When S is closed, the ammeter reading: (Ans: increases)

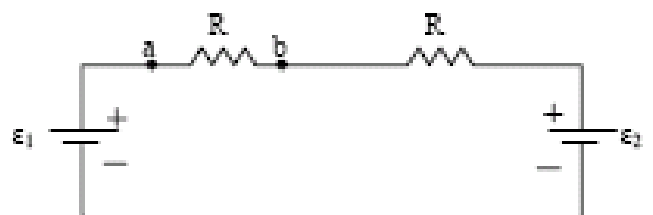


Q4. In Fig 3, what is the potential difference $V_a - V_b$? (Ans: $12\ \text{V}$)

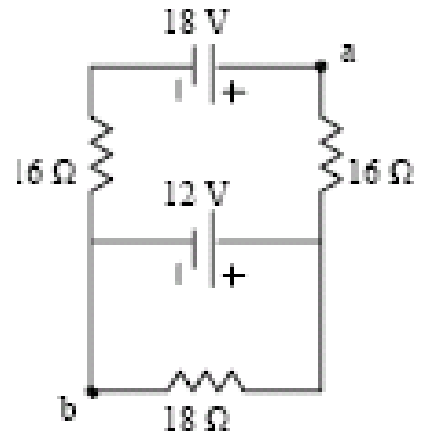


T072

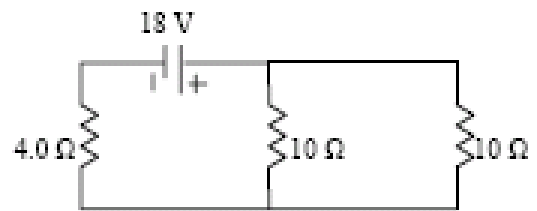
Q13. The Fig. 1 shows two resistors, each of the resistance R , connected to two ideal batteries of emf ϵ_1 and ϵ_2 ($\epsilon_1 > \epsilon_2$). The potential difference $V_a - V_b$ is equal to $\epsilon_1/5$. What is the ratio ϵ_2/ϵ_1 ? (Ans: $3/5$)



Q14. Three resistors and two batteries are connected as shown in Fig. 2. What is the potential difference $V_a - V_b$? (Ans: 15 V)



Q15. Determine the power dissipated by the 4.0Ω resistor in the circuit shown in Fig. 3. (Ans: 16 W)

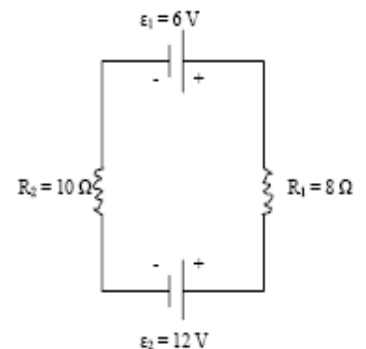


Q16. A capacitor of capacitance C takes 2 s to reach 63 % of its maximum charge when connected in series to a resistance R and a battery of emf ϵ . How long does it take for this capacitor to reach 95 % of its maximum charge (from zero initial charge)? (Ans: 6s)

Q17. Two resistors have resistances R_1 and R_2 , such that $R_1 < R_2$. If R_1 and R_2 connected in... (Ans: parallel, then $R_{eq} < R_1$ and $R_{eq} < R_2$)

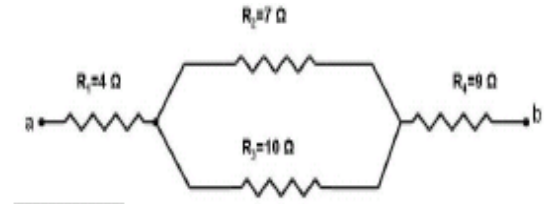
T071

Q13. A single loop circuit contains two external resistors and two emf sources as shown in the figure 1. Assume the emf sources are ideal, what is the power dissipation across resistor R_1 . (Ans: 0.9 W)

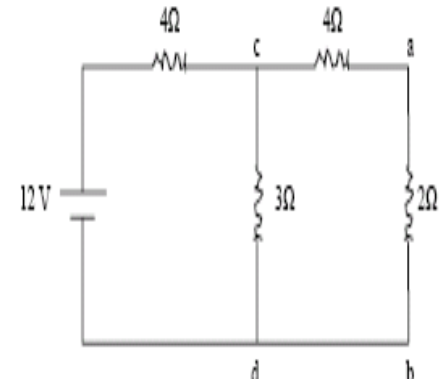


Q14. A capacitor of capacitance $5.0 \times 10^{-6} \text{ F}$ is discharging through a $4.0 \text{ M} \Omega$ resistor. At what time will the energy stored in the capacitor be half of its initial value? (Ans: 7 s)

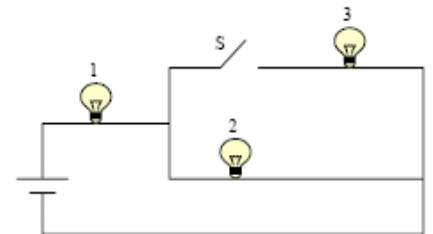
Q15. Four resistors are connected as shown in the figure 2. What is the current through R_1 , when a potential difference of 30.0 Volts is applied between points a and b? (Ans: 1.75 A)



Q16. If $V_a - V_b = 3.2 \text{ V}$, what is $V_d - V_c$ shown in Figure 3 ? (Ans: -9.6 V)



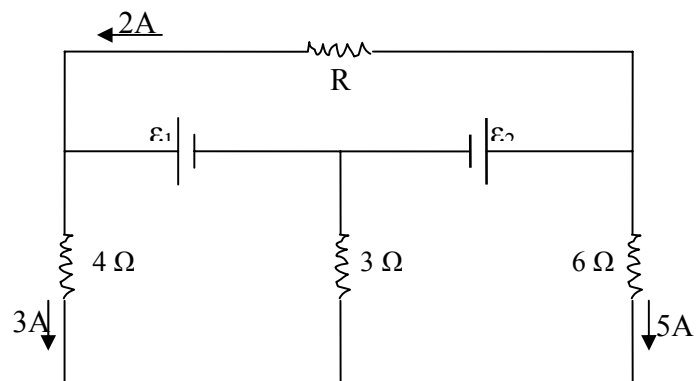
Q17. The figure below shows 3 identical light bulbs connected to a battery. What happens to the power of light bulb 1 when the switch S is closed in Figure 4? (Ans: The power increases)



T062

Q13. A 6-V battery supplies a total of 48 W to three identical light bulbs connected in parallel. The resistance of each bulb is: (Ans: 2.25 Ω)

Q14. In the following figure 1, find the current in 3 Ω resistor and the resistance R for the given currents. (Ans: 8 A, 9 Ω)



Q15. Two resistors r and R are connected in series across 100 V line. If $r = 30 \text{ k}\Omega$ and the voltage across it is found to be 60 V, find the resistance of R . (Ans: 20 $\text{k}\Omega$)

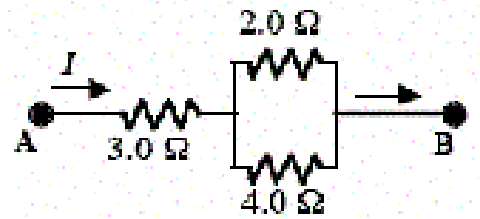
Q16. A 30.0 $\text{k}\Omega$ resistor and a capacitor are connected in series and a 15.0 V potential difference is suddenly applied across them. The potential difference across the capacitor rises to 5.00 V in 1.50 μs . Find the capacitance of capacitor (Ans: 123 pF)

Q17. Four resistors , each of $20\text{-}\Omega$, are connected in parallel and the combination is connected to a 20 V emf device. The current in any one of the resistors is: (Ans: 1.0 A)

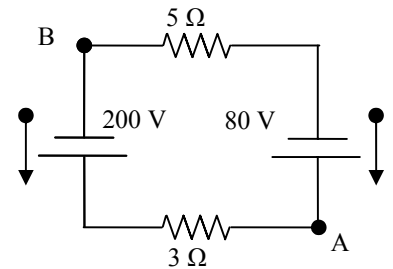
T061

Q12. Find the potential difference across $30\ \Omega$ resistor, when it is connected across a battery of emf 6 V and internal resistance of $0.5\ \Omega$.(Ans: 5.9 V)

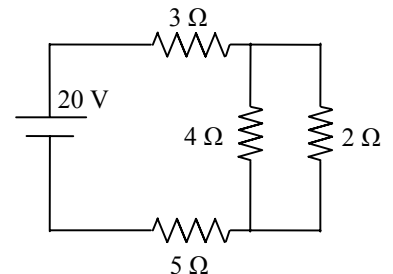
Q13. Three resistors are connected as shown in the following figure 1. The potential difference between points A and B is 30 V . How much current flows through the $4\text{-}\Omega$ resistor? (Ans: 2.3 A)



Q14. Two ideal emf sources along with two resistors are connected as shown in the figure 2. If the potential at A is 150 V , what would be the potential at point B? (Ans: -5 V)



Q15. What is the total power dissipation in the circuit shown in the following figure 3. (Ans: 43 W)



Q16. Consider a series RC circuit as shown in the following figure 4, where $R = 1.0 \times 10^6\ \Omega$, $C = 5.0\ \mu\text{F}$ and $\varepsilon = 30\text{ V}$. If the switch is closed at $t = 0$, what is the current in resistance R at time 10 s after the switch is closed? (Ans: $4.1 \times 10^{-6}\text{ A}$)

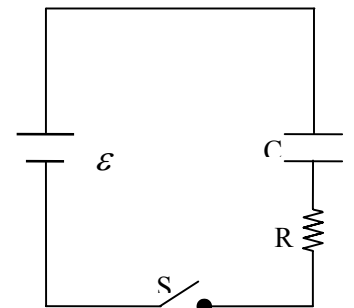


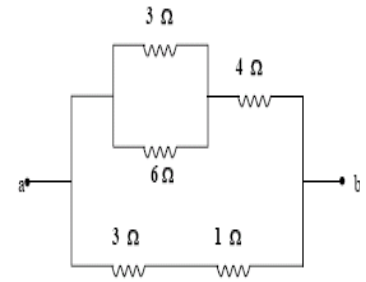
Fig. 1, T052

Fig.3, T052

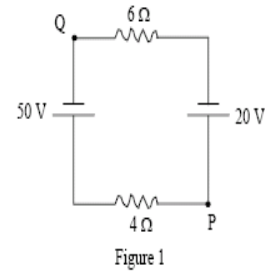
Fig. 1, T052

T052

Q2. Calculate the equivalent resistance between a and b for the circuit shown in Figure 3. (Ans: 2.4 Ω .)

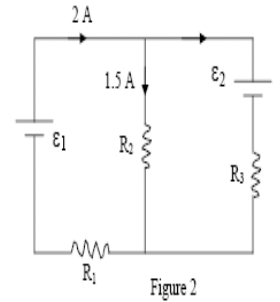


Q4. The potential at point P shown in figure 1 is 20 V. What is the potential at point Q. (Ans: -18 V.)



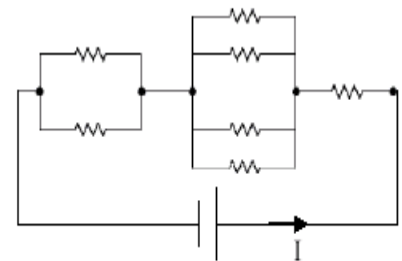
Q12. A 12 V battery supplies 100 watts power to two identical bulbs connected in series. The resistance of each bulb is: (Ans: 0.7 Ω)

Q22. In Figure 2, $R_1 = R_2 = R_3 = 5 \Omega$. What is the value of the emf of the second battery ϵ_2 . (Ans: 5 V.)

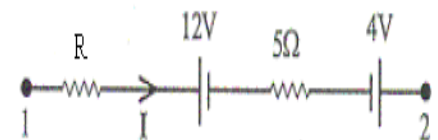


T051

Q6. In the figure 1 shown, each resistance is 1 Ω . Calculate the emf of the battery if the current I is 4 A. [Ans: 7V]

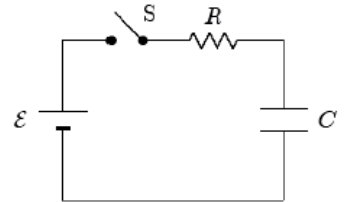


Q7. In the figure 2 shown, the potential difference between point 1 and 2, ($V_2 - V_1$), is -40 V, and the current is equal to 4.0 A, then, the value of the resistance R is [Ans: 3 Ω]



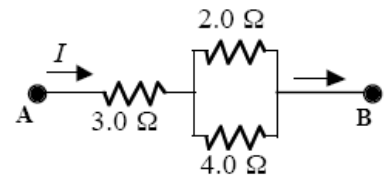
Q20. A 2.0 volt battery has an internal resistance $r = 0.2 \Omega$ is used to operate a lamp of resistance $R = 2.3 \Omega$. What is the percentage of the power delivered to the lamp relative to that of the battery? [Ans: 92 %].

Q24. An uncharged capacitor is connected as in the circuit shown in Fig. 3. When the switch is closed, the charge on the capacitor reaches half its maximum value in 20 ms. If $R=500 \Omega$ and the voltage of the battery is 10 V then the capacitance of the capacitor is: [Ans: 58 micro-F]

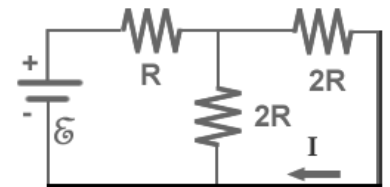


T042

Q11. Three resistors are connected as shown in figure 3. The potential difference between points A and B is 26 V. How much current flows through the 4-Ohm resistor? (Ans 2.0 A)



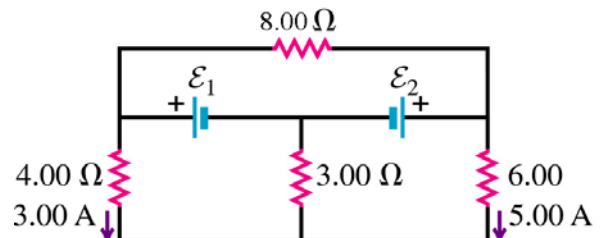
Q12. In the circuit shown in figure 4, $I = 0.65\text{A}$ and $R = 15 \text{ Ohms}$. What is the value of the emf of the battery? (Ans 39 V)



T042 Fig.4

Q13. A $5.0\text{-}\mu\text{F}$ capacitor is fully charged by connecting it to a 12-V battery. After disconnecting the battery, it was allowed for capacitor to discharge through a simple RC circuit, with a time constant of 4.0 s. What is the charge on the capacitor after one time constant has elapsed? (Ans: $2.2 \times 10^{-5}\text{C}$)

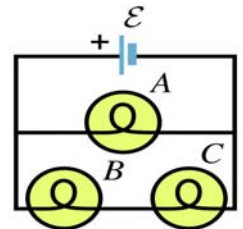
Q14. In the circuit shown in figure 5, what is the current in the 8.00-Ohm resistor? (Ans: 2.25 A to the left)



T042-Fig. 5

Q15. A number of 240-Ohms resistors are connected in parallel to a 120-V source. If the maximum current allowed in the circuit is 9 A, determine the largest number of resistors, which can be used in this circuit without exceeding the maximum current. (Ans: 18.)

Q16. In figure 6, three identical light bulbs are connected to a battery. Which one of the following statements is CORRECT? (Ans: The largest current passes through A.)



T042-Fig. 6

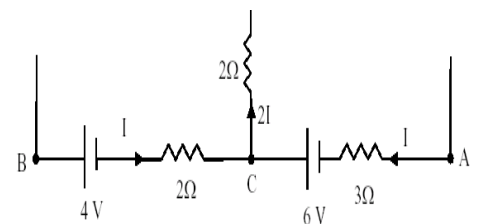
T041

Q1. The current in single-loop circuit is 5.0 A. When an additional resistance of 2.0 Ohm is added in series, the current drops to 4.0 A. What was the resistance in the original circuit? (Ans: 8.0 Ohm)

Q2. Three wires are joined together at a junction. A 0.40-A current flows toward the junction from one wire and a 0.3-A current flows away from the junction in the second wire. The current in the third wire is (Ans: 0.10-A, away from the junction).

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)

Q4. In the circuit shown in figure 1, calculate potential difference $V_B - V_A$. The points A, B and C are three junctions. [Take the current $I = 2.0$ A] (Ans: 8.0 V.)



Q5. A capacitor of capacitance C is discharging through a resistor of resistance R . In terms of RC , when will the energy stored in the capacitor reduces to one fifth of its initial value? (Ans: 0.80 RC .)