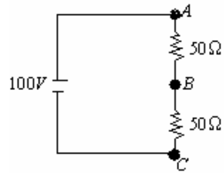
CURRENT ELECTRICITY
PREVIOUS EAMCET QUESTIONS

ENGINEERING

1. In the circuit shown below, a voltmeter of internal resistance R, when connected across B and C reads 100/3 volts. Neglecting the internal resistance of the battery, the value of R is :



(2009 E)

1) $100k\Omega$ 2) $75k\Omega$ 3) $50k\Omega$ 4) $25k\Omega$

Ans : 3

Sol: From the given circuit,

$$R_1 : R_2 = 50 : \frac{50R}{50+R} = 1 : \frac{R}{50+R}$$

[since 50Ω and R Ω are in parallel and series to 50 Ω]

$$\therefore V_1 : V_2 = 1 : \frac{R}{50+R}$$

[current is same as they are in series]

$$\Rightarrow V_2 = \left[\frac{\left(\frac{R}{50+R}\right)}{\left(1+\frac{R}{50+R}\right)}\right]100 = \frac{100}{3}$$

Given $\therefore R = 50k\Omega$

2. A cell in secondary circuit gives null deflection for 2.5 m length of potentiometer having 10m length of wire. If the length of the potentiometer wire is increased by 1m without changing the cell in the primary, the position of the null point now is : **(2009 E)**

1) 3.5m 2) 3m 3) 2.75m 4) 2.0m

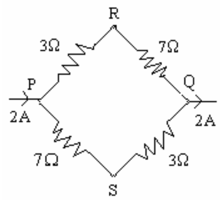
Ans :3

Sol: From the Principle of potentiometer $v \alpha l$

For 10m long potentiometer wire, the balancing length is 2.5 m

For 11m long potentiometer wire, the balancing length is $\frac{11(2.5)}{10} = 2.75m$

3. A current of 2 A flows in an electric circuit as shown in figure. The potential difference $(V_R - V_S)m$ in volts (V_R and V_S are potentials at R and S respectively) is **(2008 E)**



1) – 4 (2) + 2 (3) + 4 (4) – 2

Ans: 3

Sol: Currrent divides equally and equal to 1A in each arm

Potential across upper part and lower part is same and is equal to 10V

Potential at R is $V_R = 7V$

Potential at S is $V_S = 10 - 7 = 3V$

$\therefore V_R - V_S = 7 - 3 = 4V$

Hence (3) is the correct choice

4. When a battery connected across a resistor of 16Ω, the voltage across the resistor is 12 V. When the same battery is connected across a resistor of 10Ω, voltage across it is 11 V. The internal resistance of the battery in Ohms is **(2008 E)**

(1) $\frac{10}{7}$ (2) $\frac{20}{7}$ (3) $\frac{25}{7}$ (4) $\frac{30}{7}$

Ans: 2

Sol: Potential V = iR $\Rightarrow i = \frac{E}{R+r}$

$V = \frac{E}{R+r}R$

$12 = \frac{E}{16+r} \times 16$ …………..(1)

$11 = \frac{E}{10+r} \times 10$ …………..(2)

$r = \frac{20}{7}\Omega$ Dividing (1) & (2)

5. Two unknown resistance X and Y are connected to left and right gaps of a meter bridge and the balancing point is obtained at 80 cm from left. When a 10Ω resistance is connected in parallel to X, the balancing point is 50 cm from left. The values of X and Y respectively are **(2007 E)**

(1) 40Ω, 9Ω (2) 30Ω, 7.5Ω (3) 20Ω, 6Ω (4) 10 Ω, 3Ω

Ans: 2

Sol: From the principle of meter bridge $\frac{P}{Q} = \frac{l}{100-l}$

X = 4Y……………………..(1)

$$\frac{X10}{(X+10)Y}=\frac{50}{50}=1$$

$$\frac{X10}{(X+10)}\frac{4}{X}=1$$

$$40=X+10$$

$$X=30\Omega$$

$$Y=\frac{X}{4}=\frac{30}{4}=7.5\Omega$$

Hence (2) is the correct choice

6. The current in a circuit containing a battery connected to 2Ω resistance is 0.9 A. When a resistance of 7Ω connected to the same battery, the current observed in the circuit is 0.3A. Then the internal resistance of the battery is **(2007 E)**

(1) 0.1 Ω (2) 0.5 Ω (3) 1 Ω (4) Zero

Ans: 2

Sol: $i_i=\frac{E}{R_1+r}, i_2=\frac{E}{R_2+r}$ since $\mathrm{i}=\frac{\mathrm{E}}{\mathrm{R+r}}=\frac{\mathrm{EMF}}{\mathrm{Total\ resistance}}$

$$\frac{0.9}{0.3}=\frac{\frac{E}{2+r}}{\frac{E}{7+r}}=\frac{7+r}{2+r}$$

$$3=\frac{7+r}{2+r}\Rightarrow 6+3r=7+r$$

$$2r=1\Rightarrow r=\frac{1}{2}=0.5\Omega$$

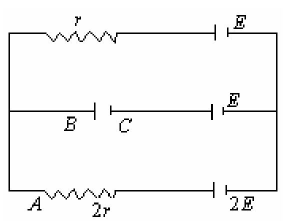
Hence (2) is the correct choice

7. One end each of a resistance 'r' capacitance C and resistance '2r' are connected together. The other ends are respectively connected to the positive terminals of the batteries P, Q, R having respectively e.m.f s E, E and 2E. The negative terminals of the batteries are then connected together. In this circuit, with steady current the potential drop across the capacitance is : **(2006 E)**

1) $\frac{E}{3}$ 2) $\frac{E}{2}$ 3) $\frac{2E}{3}$ 4) E

Ans: 1

Sol:



As a capacitor is connected there is no current in second brach, in steady state.

∴ current through the outer loop $i=\frac{2E-E}{2r+r}=\frac{E}{3r}$

$\therefore$ potential difference across upper branch $= E + \left(\frac{E}{3r}\right) r = \frac{4E}{3}$

This is also p.d. through middle branch

$\therefore$ p.d. across capacitor $= \frac{4E}{3} - E$

$= \frac{E}{3}$

8. Twelve cells, each having e.m.f 'E' volts are connected in series and are kept in a closed box. Some of these cells are wrongly connected with positive and negative terminals reversed. This 12 cell battery is connected in series with an ammeter, an external resistance 'R' ohms and a two-cell battery (two cells of the same type used earlier, connected perfectly in series). The current in the circuit when the 12-cell battery and 2-cell battery aid each other. Then the number of cells in 12-cells battery that are connected wrongly is **(2006 E)**

1) 4 2) 3 3) 2 4) 1

Ans: 4

Sol: Let no. of cells be wrongly connected is n

$i_1 = \frac{12E - 2nE + 2E}{R} = 3$ (1)

$i_2 = \frac{12E - 2nE - 2E}{R} = 2$ (2)

Dividing (1) & (2)

$\frac{12 - 2n + 2}{12 - 2n - 2} = \frac{3}{2}$

$\frac{14 - 2n}{10 - 2n} = \frac{3}{2}$

$\frac{7 - n}{5 - n} = \frac{3}{2}$

$14 - 2n = 15 - 3n$

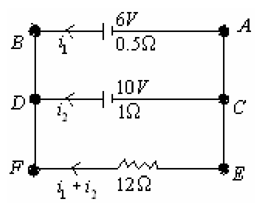
n = 1

9. A 6V cell with $0.5\,\Omega$ internal resistance, a 10V cell with $1\,\Omega$ internal resistance and a $12\,\Omega$ external resistance are connected in parallel. The current (in amperes) through the 10V cell is **[2005 E]**

1) 0.60 2) 2.27 3) 2.87 4) 5.14

Ans: 3

Sol:



Potential difference across

AB, CD & EF are same. Applying Kirchoff's Laws

$6-0.5i_1=10-i_2=12(i_1+i_2)$

From above equation $i_2=2.87A$

10. In a meter bridge a resistance is connected in the left gap and a pair of resistances P and Q in the right gap. Measured from the left, the balance point is 37.5 cm when P and Q are in series and 71.4 cm when they are parallel. The values of P and Q (in) are : **[2005 E]**

1) 40; 10 2) 35; 15 3) 30; 20 4) 25; 25

Ans: 3

Sol: If P & Q are in series

$$\frac{30}{R_P+R_Q}=\frac{37.5}{62.5}\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

If P & Q are in parallel

$$\frac{30}{\frac{R_PR_Q}{R_P+R_Q}}=\frac{71.4}{28.6}\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

From (1) & (2)

$R_P=30\Omega$, $R_Q=20\Omega$

11. 'n' conducting wires of same dimensions but having resistivities 1, 2, 3,...n are connected in series. The equivalent resistivity of the combination is (2004 E)

1) $\frac{n(n+1)}{2}$ 2) $\frac{n+1}{2}$ 3) $\frac{n+1}{2n}$ 4) $\frac{2n}{n+1}$

Ans :1

Sol : We know that R = $\frac{\rho L}{A}$

When 'n' conducting wires of same dimensions but having resistivities 1,2,3……n are connected in series.

R = R_1+R_2 +………R_3

Let ρ is the equivalent resistivity

$$\Rightarrow\frac{\rho L}{A}=\frac{L}{A}(1+2+3+.....n)$$

$$\Rightarrow\frac{\rho L}{A}=\frac{L}{A}\times\frac{n(n+1)}{2}$$

$\Rightarrow$ equivalent resistivity $\rho=\frac{n(n+1)}{2}$

12. Two cells A and B are connected in the secondary circuit of a potentiometer one at a time and the balancing length are respectively 400cm and 440 cm. The e.m.f. of the cell A is 1.08 volt. The e.m.f. of the second cell B in volts is **(2004 E)**

1) 1.08 2) 1.188 3) 11.88 4) 12.8

Ans : 2

Sol: $\frac{E_1}{E_2}=\frac{l_1}{l_2}\Rightarrow E_2=E_1\frac{l_2}{l_1}$

$=1.08\times\frac{440}{400}=1.188$

13. In a potentiometer experiment, the balancing length with a cell is 560 cm. When an external resistance of 10 ohm is connected in parallel to the cell, the balancing length changes by 60cm. The internal resistance of the cell in ohms is **(2003 E)**

1) 3.6 2) 2.4 3) 1.2 4) 0.6

Ans :3

Sol: $r=\frac{R\left(l_1-l_2\right)}{l_2}=\frac{10\times 60}{500}=1.2\Omega$

Since $l_1-l_2=60$ and $l_1=560$ cm

$\therefore l_2=560-60$

$\therefore l_2=500\ cm$

14. Two resistances of 400Ω and 800Ω are connected in series with 6 volt battery of negligible internal resistance. A voltmeter of resistance 10,000 Ω is used to measure the potential difference across 400Ω. The error in the measurement of potential difference in volt approximately is**(2003 E)**

1) 0.01 2) 0.02 3) 0.03 4) 0.05

Ans: 4

Sol: The expected voltage drop across 400Ω resistor is

$V=\frac{6\times 400}{400+800}=2\,volt$

When the volt meter is included in parallel, the combined resistance of 400Ω and 10000Ω is

$\frac{400\times 10000}{10400}=\frac{40000}{104}=384.6\Omega$

The voltage drop is $V^1=\frac{6\times 384.6}{384.6+800}=1.948$

$\Delta V=V-V^1=2-1.948=0.052V$

15. The balancing length for a cell is 560 cm in a potentiometer experiment. When an external resistance of 10 is connected in parallel to the cell, the balancing length changes by 60cm. The internal resistance of the cell in ohms is **[2002 E]**

1) 1.6 2) 1.4 3) 1.2 4) 0.12

Ans : 3

Sol: When 10Ω resistance is connected in parallel, the effective resistance to be balanced is $\frac{10r}{10+r}$

$\frac{l_1}{R_1}=\frac{l_2}{R_2}$

Since the resistance is connected in parallel,

$R_2<R_1$ and $l_2<l_1$. Hence $l_2=l_1-50$

= 560-60

=500 cm

$\frac{560}{r} = 500\frac{(10+r)}{10r}$

$\Rightarrow r = 1.2\Omega$

16. A conductor of resistance 3 ohm is stretched uniformly till its length is doubled. The wire now is bent in the form of an equilateral triangle. The effective resistance between the ends of any side of the triangle in ohms is **[2002 E]**

1) $\frac{9}{2}$ 2) $\frac{8}{3}$ 3) 2 4) 1

Ans : 2

Sol: $R = \frac{\rho l}{A} = \frac{\rho l^2}{Al} = \frac{\rho l^2}{volume}$, where the volume does not change on stretching .

The new resistance

$R^1 = \frac{\rho(2l)^2}{volume} = 4R = 4\times 3 = 12\Omega$

Each side will have resistance 4Ω

Two sides in series have resistance 8Ω and the third side of resistance 4Ω is in parallel.

The effective resistance = $\frac{4\times 8}{4+8} = \frac{8}{3}\Omega$

17. A uniform conductor of resistance R is cut into 20 equal pieces. Half of them are joined in series and the remaining half of them are connected in parallel. If the two combinations are joined in series, the effective resistance of all the pieces is **[2002 E]**

1) R 2) $\frac{R}{2}$ 3) $\frac{101R}{200}$ 4) $\frac{201R}{200}$

Ans: 3

Sol: Each part has resistance $\frac{R}{20}$

10 parts in series have total resistance $10\times\frac{R}{20} = \frac{R}{2}$. The remaining 10 parts in parallel have resistance $\frac{1}{10}\times\frac{R}{20} = \frac{R}{200}$.

The resistance of these two combination in series is $\frac{R}{2} + \frac{R}{200} = \frac{101R}{200}$

18. Two wires of equal diameters, of resistivities ρ_1, ρ_2 and lengths x_1 and x_2 respectively are joined in series. The equivalent resistivity of the combination is **[2002 E]**

1) $\frac{\rho_1 x_1 + \rho_2 x_2}{x_1 + x_2}$ 2) $\frac{\rho_1 x_2 - \rho_2 x_1}{x_1 - x_2}$ 3) $\frac{\rho_1 x_2 + \rho_2 x_1}{x_1 + x_2}$ 4) $\frac{\rho_1 x_1 - \rho_2 x_2}{x_1 - x_2}$

Ans: 1

Sol: Equivalent resistance of the combination

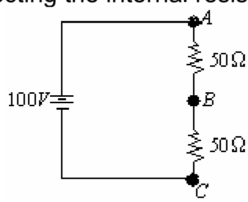
$R = R_1 + R_2$ [As they are in series]

$$\frac{\rho(x_1+x_2)}{\pi r^2} = \frac{\rho_1 x_1}{\pi r^2} + \frac{\rho_2 x_2}{\pi r^2}$$

$$\rho_{eq} = \frac{\rho_1 x_1 + \rho_2 x_2}{x_1 + x_2}$$

MEDICAL

19. In the circuit shown below, a voltmeter of internal resistance R, when connected across B and C reads 100/3 volts. Neglecting the internal resistance of the cell, the value of R is :

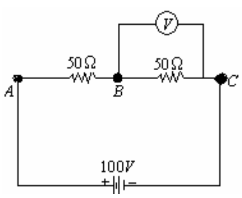


(2009 M)

1) $100k\Omega$ 2) $75k\Omega$ 3) $50k\Omega$ 4) $25k\Omega$

Ans : .3

Sol:



pd across B, $C = \frac{100}{3}V$

$$R_{effective} = \frac{50R}{50+R}$$

$$i = \frac{V}{R} = \frac{100}{\left(50+\frac{50R}{50+R}\right)} = \frac{100}{3\left[\frac{50R}{50+R}\right]}$$

$$\Rightarrow 2500 + 100R = 150R$$

$$\Rightarrow 50R = 2500$$

$$\therefore R = 50k\Omega$$

20. A flash light lamp is marked 3.5V and 0.28A. The filament temperature is 425^0C. The filament resistance of 0^0C is 4Ω. Then, the temperature coefficient of resistance of the material of the filament is: **(2009M)**

1) $8.5\times10^{-3}/K$ 2) $3.5\times10^{-3}/K$ 3) $0.5\times10^{-3}/K$ 4) $5\times10^{-3}/K$

Ans: 4

Sol: Given resistance at 425^0C

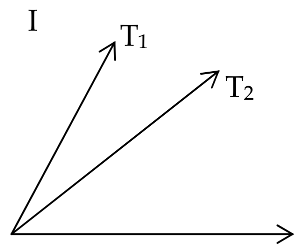
$$R_2 = \frac{V}{i} = \frac{3.5}{0.28} = 12.5\Omega$$

Resistance at 0^0C $R_1 = 4\Omega$

$\therefore \alpha = \dfrac{R_2 - R_1}{R_1(\Delta t)}$

= $\dfrac{12.5-4}{4(425)} = 5\times10^{-3}/K$

21. I and V are respectively the current and voltage in a metal wire of resistance 'R'. Two I-V graphs at two different temperatures T_1 and T_2 are given in the graph. Then **(2008 M)**



(1) $T_1 = T_2$ (2) $T_1 > T_2$ (3) $T_1 < T_2$ (4) $T_1 = 2T_2$

Ans: 3

Sol: V = iR

For given voltage $i \propto \dfrac{1}{R}$

Resistance increase with increase of temperature and temperature are inversely proportional to voltages.

$\therefore T_1 < T_2$

22. A projector lamp can be used at a maximum voltage of 60 V, its resistance is $20\,\Omega$, the series resistance (in ohms) required to operate the lamp from a 75 V supply is **(2008 M)**

(1) 2 (2) 3 (3) 4 (4) 5

Ans: 4

Sol: $i = \dfrac{V}{R}$

For 60V, 20Ω resistance is required

For 75V i.e., extra 15V is required

$\dfrac{V_1}{R_1} = \dfrac{V_2}{R_2} \Rightarrow \dfrac{60}{20} = \dfrac{75}{R_2}$

R_2 = 25

The required additional resistance is 25-20 = 5 Ω

23. A teacher asked a student to connect 'N' cells each of e.m.f. 'e' in series to get a total e.m.f. of Ne. While connecting, the student, by mistake, reversed the polarity of 'n' cells. The total e.m.f. of the resulting series combination is : **[2006 M]**

1) $e\left(N-\dfrac{n}{2}\right)$ 2) $e(N-n)$ 3) $e(N-2n)$ 4) eN

Ans: 3

Sol: Total emf = Ne

Present $emf = (N-2n)e$

When n cells reversely connected the emf of 2n cells get cancelled.

24. Two wires A and B, made of same material and having their lengths in the ratio 6 : 1 are connected in series. The potential differences across the wires are 3V and 2V respectively. If r_A *and* r_B radii of A and B respectively, then $\frac{r_B}{r_A}$ is : **(2005 M)**

1) $\frac{1}{4}$ 2) $\frac{1}{2}$ 3) 1 4) 2

Ans: 2

Sol: Ratio of potentials $\frac{V_1}{V_2} = \frac{R_1}{R_2} = \frac{l_1 r_B^2}{l_2 r_A^2}$

[As they are connected in series current is same]

$i_A = i_B \therefore R = \frac{Sl}{A} \Rightarrow \frac{R_1}{R_2} = \frac{l_1}{l_2} \times \frac{r_2^2}{r_1^2}$

$\frac{3}{2} = \frac{6}{1}\frac{r_B^2}{r_A^2}$

$\therefore \frac{r_B}{r_A} = \frac{1}{2}$

25. For a chosen non-zero value of voltage, there can be more than one value of current in : **(2005 M)**

1) Copper wire 2) Thermistor

3) Zener diode 4) Manganine wire

Ans: (3) All semi conductors devices give more than one current value for a given voltage.

26. The temperature coefficient resistivity of a material is 0.0004/K. When the temperature of the material is increased by 50º C, its resistivity increases by 2×10^{-8} ohm-meter. The initial resistivity of the material in ohm-meter is **(2004 M)**

1) 50×10^{-8} 2) 90×10^{-8} 3) 100×10^{-8} 4) 200×10^{-8}

Ans : 3

Sol: $\rho_2 = \rho_1(1+\alpha\Delta\theta)$ where $\propto$ is the coefficient of resistivity

$\Rightarrow \rho_1 = \frac{\rho_2 - \rho_1}{\alpha\Delta\theta} = \frac{2\times10^{-8}}{0.0004\times50}$

$= 100\times10^{-8}\Omega - m$

27. Two cells with the same EMF 'E" and different internal resistances r_1 and r_2 are connected in series to an external resistance R. The value of R so that the potential difference across the first cell be zero is **(2003 M)**

1) $\sqrt{r_1 r_2}$ 2) r_1+r_2 3) $r_1 - r_2$ 3) $\frac{r_1+r_2}{2}$

Ans:3

Sol: $i = \frac{2E}{R+r_1+r_2} = \frac{Total\ E.M.F.}{Total\ resistance}$

$V_1 = E - ir_1 = E - \frac{2Er_1}{R+r_1+r_2}$

$= \frac{E(R+r_2-r_1)}{(R+r_1+r_2)} = 0$ [since p.d. across first cell = 0]

$\Rightarrow R + r_2 - r_1 = 0$

$\Rightarrow R = r_1 - r_2$

28. Three unequal resistors in parallel are equivalent to a resistance 1 ohm. If two of them are in the ratio 1 : 2 and if no resistance value is fractional, the largest of the three resistances in ohms is **(2003 E)**

1) 4 2) 6 3) 8 4) 12

Ans : 2

Sol: $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{2R_3} + \frac{1}{R_3}$

$\Rightarrow \frac{1}{R} = \frac{1}{R_1} + \frac{3}{2R_3}$

$\Rightarrow 1 - \frac{3}{2-R_3} = \frac{1}{R_1} \Rightarrow R_1 = \frac{2R_3}{2R_3-3}$

If $R_3 = 3$ then $R_1 = 2\Omega$

$\therefore R_1 = 2\Omega$

$R_2 = 6\Omega$

$R_3 = 3\Omega$

$\therefore$ Largest resistance = 6Ω

29. In potentiometer experiment a cell of emf. 1.5 V connected in the secondary circuit gives a balancing length of 165cm of the wire. If a resistance of 5 is connected parallel to the cell, the balancing length of the wire is 150cm. The internal resistance of the cell is **[2002 M]**

1) 5 2) 1.5 3) 1 4) 0.5

An s: 4

Sol: $\frac{l_1}{R_1} = \frac{l_2}{R_2}$

If r is the internal resistance of the cell,

$R_2 = \frac{5r}{5+r} \Rightarrow \frac{165}{r} = \frac{150(5+r)}{5r}$

$\Rightarrow r = 0.5\Omega$

30. The sides of a rectangular block are 2cm, 3cm and 4cm. The ratio of the maximum to minimum resistance between its parallel faces is **[2002 M]**

1) 4 2) 3 3) 2 4) 1

Ans: 1

Sol: $R = \frac{\rho l}{A}$ The dimensions of the block are $2 \times 3 \times 4$

$$R_{max} = \frac{\rho l_{max}}{A_{min}} = \frac{\rho \times 4}{2 \times 3} = \frac{2\rho}{3}$$

$$R_{min} = \frac{\rho l_{min}}{A_{max}} = \frac{\rho \times 2}{3 \times 4} = \frac{\rho}{6}$$

$$\frac{R_{max}}{R_{min}} = 4$$

31. Three equal resistances each of 3 are in series and connected to a cell of internal resistance one ohm. If these resistances are in parallel and connected to the same cell, then the ratio of the respective currents through the electric circuits in the two cases is **[2002 M]**

1) $\frac{1}{8}$ 2) $\frac{1}{7}$ 3) $\frac{1}{5}$ 4) $\frac{1}{3}$

Ans: 3

Sol: In the series arrangement, $R_1 = (3 \times 3) + 1 = 10\Omega$

$$i_1 = \frac{V}{R_1} = \frac{V}{10} \qquad (1)$$

In the parallel arrangement, $\frac{1}{R} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$

$\Rightarrow R = 1\Omega$, $R_2 = 1 + 1 = 2\Omega$

$$i_2 = \frac{V}{R_2} = \frac{V}{2} \qquad (2)$$

Dividing (1) & (2) $\frac{i_1}{i_2} = \frac{1}{5}$

32. An ideal battery of emf 2V and a series resistance R are connected in the primary circuit of a potentiometer of length 1m and resistance 5Ω. The value of R to give a potential difference of 5mV across the 10cm of potentiometer wire is **[2002 M]**

1) 180Ω 2) 190Ω 3) 195Ω 4) 200Ω

Ans: 3

Sol: Voltage drop across the potentiometer wire is

$$V = 5 \times 10^{-3} \times \frac{100}{10} = 0.05V$$

Current, $i = \frac{V}{R+5} = \frac{2}{R+5}$ Where R = Series Resistance

V = iR, where R' = resistance of potentiometer wire

$$0.05 = \frac{2}{R+5} \times 5$$

$$\Rightarrow R = 195\Omega$$

33. A nichrome wire 50cm long and one square millimeter cross-section carries a current of 4A when connected to a 2V battery. The resistivity of nichrome wire in ohm-meter is **[2002 M]**

1) 1×10^{-6} 2) 4×10^{-7} 3) 3×10^{-7} 4) 2×10^{-7}

Ans: 1

Sol: $R = \frac{\rho l}{A} \Rightarrow \rho = \frac{RA}{l} = \frac{V}{l}.\frac{A}{l} = \frac{2}{4} \times \frac{1\times10^{-6}}{0.5}$

$= 10^{-6}\Omega - m$

34. When a resistor of 11Ω is connected in series with an electric cell, the current flowing in it is 0.5A. Instead when a resistor of 5Ω is connected to the same electric cell in series, the current increases by 0.4A. The internal resistance of the cell is **[2002 M]**

1) 1.5 2) 2 3) 2.5 4) 3.5

Ans: 3

Sol: Since the same cell is used,

$V = i_1(R_1 + r) = i_2(R_2 + r)$

$\Rightarrow 0.5(11 + R) = (0.5 + 0.4)(5 + r)$

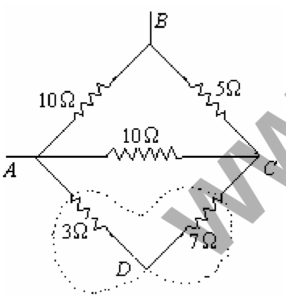
$\Rightarrow r = 2.5\Omega$

35. Four resistances 10, 5,7 and 3 are connected so that they form the sides of a rectangle AB, BC, CD and DA respectively. Another resistance of 10 is connected across the diagonal AC. The equivalent resistance between A and B is **[2000 M]**

1) 2 2) 5 3) 7 4) 10

Ans:2

Sol:



(i) From the circuit, $3\Omega \,\&\, 7\Omega$ resistors are in series. Their resultant resistance is 10Ω

(ii) 10Ω and are in parallel and their resultant is 5Ω

(iii) 5Ω and 5Ω are in series and are parallel to 10Ω

36. In a meter bridge experiment, the ratio of the left gap resistance to right gap resistance is 2:3, the balance point from left is **(2007 E)**

1) 60 cm 2) 50 cm 3) 40 cm 4) 20 cm

Ans. 3

Sol: $\frac{X}{R} = \frac{l_1}{100 - l_1} \Rightarrow \frac{2}{3} = \frac{l_1}{100 - l_1}$

$200 - 2l_1 = 3l_1 \Rightarrow 200 = 5l_1$

$l_1 = 40cm$

37. An aluminium $\left[\rho = 2.2\times10^{-8}\Omega m\right]$ wire of a diameter 1.4 mm is used to make a 4Ω resistor. The length of the wire is **(2007E)**

1) 220m 2) 1000m 3) 280m 4) 1m

Sol: $R = \frac{\rho l}{A} \Rightarrow l = \frac{RA}{\rho} = \frac{R\pi r^2}{\rho}$ (2007 E)

$= 4\times\frac{22}{7}\times\frac{\left(0.7\times10^{-3}\right)^2}{2.2\times10^{-8}} = 280m$