11. (1)

Total e.m.f. = nE, Total resistance R + nr

$\Rightarrow i = \frac{nE}{R + nr}$

12. (2)

Since $i = \left(\frac{E}{R + r}\right)$, we get

$0.5 = \frac{E}{2 + r}$ … (i)

$0.25 = \frac{E}{5 + r}$ … (ii)

$2 = \frac{5 + r}{2 + r} \Rightarrow 4 + 2r = 5 + r \Rightarrow r = 1$

r = 1 sub in (1), we get E = 1.5

13. (2)

$r = R\left(\frac{l_1}{l_2} - 1\right) = 2\left(\frac{240}{120} - 1\right) = 2\,\Omega$

14. (2)

$i = \frac{E}{r} = \frac{6}{0.5} = 12\,\text{amp.}$

15. (1)

Wheatstone bridge is balanced, therefore

$\frac{P}{Q} = \frac{R}{S}$ or $1 = \frac{10}{S} \Rightarrow S = 10\,\text{ohm}$

16. (2)

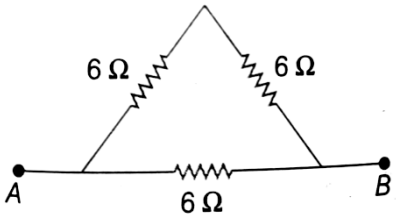
The actual circuit is same.

17. (3)

$\frac{E_1}{E_2} = \frac{l_1 + l_2}{l_1 - l_2} = \frac{58 + 29}{58 - 29} = \frac{3}{1}$

18. (4)

Resistance of each arm of equilateral triangle will be $R = \frac{18}{3} = 6\,\Omega$



So we have following combination will be Equivalent resistance is

$\therefore R_{AB} = \frac{12 \times 6}{12 + 6} = \frac{12 \times 6}{18} = 4\,\Omega$

19. (4)

Drift speed, $v_d = \frac{1}{neA} \propto \frac{1}{A}$

Therefore, for non-uniform cross-section (different values of A) drift speed will be different at different sections. Only current (or rate of flow of charge) will be same.

20. (1)

All the three resistances are in parallel.

Therefore, $\frac{1}{R_{eq}} = \frac{1}{2R} + \frac{1}{2R} + \frac{1}{R} = \frac{2}{R}$

$\therefore R_{eq} = \frac{R}{2}$

21. (3)

22. (1)

23. (2)

As $R = \frac{V}{I} = \frac{W}{ql}$

$\therefore [R] = \frac{[ML^2T^{-2}]}{[AT][A]} = [ML^2T^{-3}A^{-2}]$

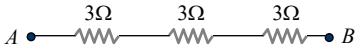
24. (2)

Current through each arm DAC and DBC = 1A

$V_D - V_A = 2$ and $V_D - V_B = 3 \Rightarrow V_A - V_B = +1V$

25. (4)

The network can be redrawn as follows



$\Rightarrow R_{eq} = 9\Omega$

26. (1)

27. (2)

The circuit is a balanced Wheatstone bridge, because

$\frac{2\Omega}{2\Omega} = \frac{4\Omega}{4\Omega}$

The 7Ω resistance is ineffective

$\therefore$ Resistance of the upper arms = 2 + 2 = 4Ω

Resistance of the lower arms = 4 + 4 = 8 Ω

These two resistances are in parallel

$\therefore R_{AB} = \frac{4\times 8}{4+8} = \frac{32}{12} = \frac{8}{3}\Omega$

28. (4)

$S = \left(\frac{100-l}{l}\right).R$

Initially, $30 = \left(\frac{100-l}{l}\right)\times 10 \Rightarrow l = 25cm$

Finally, $10 = \left(\frac{100-l}{l}\right)\times 30 \Rightarrow l = 75cm$ So, shift = 50cm.

29. (3)

Here $\varepsilon = 3$ V, $\varepsilon_1 = 1.08$ V, $l_1 = 216$ cm, $l = ?$

As $\frac{\varepsilon}{\varepsilon_1} = \frac{l}{l_1}$ $\therefore l = \frac{\varepsilon}{\varepsilon_1}\times l_1 = \frac{3\times 216}{1.08} = 600$ cm

30. (2)

Order of drift velocity

$= 10^{-4}$ m / sec $= 10^{-2}$ cm / sec