$= 12\Omega.$

WS-14 for class 6th

T.task

(1) Given $i = 0.2 A$.

$R = 10\Omega$.

$E = 2.1 V$

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

$\Rightarrow 0.2 = \frac{2.1}{r+10}$

$\Rightarrow r+10 = \frac{21}{2} = 10.5$

$\Rightarrow r = 0.5\ \Omega$

(2) $E_1 = 3V$; $E_2 = 2V$

$E_{eff} = E_1 + E_2 = 3+2 = 5V$

(3) Given $E_1 = 3V$; $E_2 = 2V$

$i = 10A$ $\quad i = \frac{E_1 + E_2}{R}$

$\Rightarrow 10 = \frac{3+2}{R}$

$\Rightarrow R = \frac{5}{10} = 0.5\ \Omega$

(4) $n = 6$; $m = 2$

$E\ m.f = (n-2m)E$

$= (6-2(2))E$

$= (6-4)E$

$= 2E$

(5) $n = 4$; e.m.f = 2V

$r = 1\Omega$; $R = 6\Omega$.

$\frac{1}{r_{eff}} = \frac{1}{1}+\frac{1}{1}+\frac{1}{1}+\frac{1}{1}$

$r_{eff} = \frac{1}{4} = 0.25$

$i = \frac{T.E.m.f}{T.Resis} = \frac{2}{6+0.25}$

$i = \frac{2}{6.25} = 0.32A$

(6) $i = 0.1A$ $\quad$; $i = \frac{E}{r+R}$

$\Rightarrow 0.1 = \frac{1.5}{r+10}$

$\Rightarrow r+10 = 15$

$\Rightarrow r = 5\ \Omega$

(7) $n = 3$; No. of combinations $= 2^{n-1}$

$= 2^{3-1} = 4$.

(8) $n = 4$; No. of combinations $= 2^n$

$= 2^4 = 16$

& (10) also

(9) $E_1 = 2V$ $\quad r_1 = 1\Omega$ $\quad R = 5\Omega$

$E_2 = 4V$ $\quad r_2 = 0.5\Omega$

E.m.f of the combination $= \frac{\frac{E_1}{r_1}+\frac{E_2}{r_2}}{\frac{1}{r_1}+\frac{1}{r_2}}$

$= \frac{\frac{2}{1}+\frac{4}{0.5}}{1+\frac{1}{0.5}} = \frac{2+8}{1+2}$

$E = \frac{10}{3} = 3.33V$

(10) ~~Along with~~

Total resistance in circuit

$= \frac{1}{r_1}+\frac{1}{r_2}+R$

$= 1+\frac{1}{0.5}+5 = 1+2+5$

$= 8\Omega$

$i = \frac{E}{T.R} = \frac{3.33}{8} = 0.41A$.

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(15) (i) $E = 10V$; $r = 3\Omega$

$R = 17\Omega$; $i = 0.5A$

(i) Total Resistance $= R + r$

$= 17 + 3$

$= 20\Omega$.

(ii) $V = E - ir$

$= 10 - 0.5 \times 3$

$= 10 - 1.5$

$\Rightarrow 8.5V$.

(16) $E_1 = 10V$; $E_2 = 30V$

Total e.m.f

$E = E_1 + E_2$

$= 10 + 30$

$= 40V$.

(17) $E = 50V$; $R = 10\Omega$; $i = 4.5A$

$i = \frac{E}{R+r} \Rightarrow 4.5 = \frac{50}{10+r}$

$\Rightarrow 10 + r = \frac{50}{4.5} = \frac{500}{45} = 11.1$

$\Rightarrow r = 1.1\Omega$.

Task

(1) $n = 4$; $E = 1V$

$m = 1$ $r = 0.5\Omega$; $R = 1\Omega$

$i = \frac{E_{total}}{R} = \frac{(n-2m)E}{nr + R}$

$i = \frac{(4 - 2(1))1}{4 \times 0.5 + 1} = \frac{4-2}{2+1}$

$i = \frac{2}{3}A$.

(2) $E = 2V$; $n = 12$

$m = 3$

e.m.f $= (n - 2m)E$

$= (12 - 2(3)) \times 2$

$\Rightarrow (12 - 6) \times 2$

$= 12V$

(3) $E_1 = 1.25V$; $E_2 = 0.75V$

$r_1 = r_2 = 1\Omega$.

Since Both cells are having same ~~exact~~ internal resistance for high e.m.f is emf of combination e.m.f $= 1.25V$.

(4) Here two cells are identical, if they are connected in parallel. e.m.f = constant their effective e.m.f = 20V.

(5) Given $R_1 = 16\Omega$, $V_1 = 12V$; $V_1 = E - i_1 r$

$R_2 = 10\Omega$; $V_2 = 11V$. $\Rightarrow 12 = E - i_1 r \rightarrow (1)$

$V_2 = E - i_2 r \Rightarrow 11 = E - i_2 r \rightarrow (2)$

By doing (1) - (2) $\Rightarrow 12 - 11 = \cancel{E} - i_1 r - \cancel{E} + i_2 r$

$\Rightarrow 1 = i_2 r - i_1 r \Rightarrow i = \frac{V_2}{R_2} r - \frac{V_1}{R_1} r$

$\Rightarrow 1 = \left[\frac{11}{10} - \frac{12}{16}\right] r \Rightarrow r = \frac{20}{7}\Omega$

(6) Given $E_1 = 2V$; $E_2 = 4V$; $E_3 = 6V$.

Effective e.m.f $E = E_1 + E_2 + E_3$

$= 2 + 4 + 6 = 12V$

(7) No. of wires are $n = 5$.

No. of combinations $= 2^{n-1} = 2^{5-1} = 2^4 = 16$

(8) $n = 5$; $r = 6\Omega$

Effective resistance $= nr$ in series combination

$= 5 \times 6$

$= 30\Omega$

(9) Given $r_1 = 0.3\Omega$; $E_1 = 2V$

$r_2 = 0.6\Omega$; $E_2 = 3V$

$$E.m.f = \frac{\frac{E_1}{r_1} + \frac{E_2}{r_2}}{\frac{1}{r_1} + \frac{1}{r_2}}$$

$$= \frac{\frac{2}{0.3} + \frac{3}{0.6}}{\frac{1}{0.3} + \frac{1}{0.6}}$$

By solving it

$$E.m.f = \frac{2.1}{0.9} = \frac{21}{9} = \frac{7}{3}$$

$= 2.33V.$

(10) Given $E = 5V$; $n = 10$

$m = 3$

Effective e.m.f $= (n-2m)E$

$= (10 - 2\times3)\times5$

$= (10-6)\times5$

$= 4\times5$

$= 20V.$

(15) (i) Given $E_A = E_V = 2.4V$

$R = 1\Omega$; $r_A = 1.9\Omega$; $r_B = 0.9$

Total ~~Internal~~ resistance of combination $= \frac{1}{r_1} + \frac{1}{r_2} + R$

$= \frac{1}{1.9} + \frac{1}{0.9} + 1 = 3.8$

(ii) $i = \frac{Emf}{3.8} = \frac{4}{3.8} = 1.05A$

(16) $n = 5$; $R = 1$

Effective resistance of parallel combination

$$R_p = \frac{R}{n} = \frac{1}{5} = 0.2\Omega$$

(17) Here 6 cells are identical and are connected in parallel. effective e.m.f = constant

$= 6V.$

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