

PHYSICS

CAPACITORS AND CURRENT ELECTRICITY

81. (4)

$$V_c = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2}$$

$$V_c = \frac{kC(0) + CV}{kC + C} = \frac{V}{k+1}$$

82. (4)

For bridge is balanced $\frac{2}{4} = \frac{3}{2+R}$

$$\Rightarrow 2+R = 6 \Rightarrow R = 4$$

83. (1)

$$I = \frac{20}{2} = 10 \Rightarrow V = 2 \times 5 = 10V$$

84. (3)

$$R \propto l^2$$

$$R_2 = n^2 R = 3^2 R = 9 \times 20 = 180$$

85. (3)

$$q = CV = C(IR) = C \left[\frac{E}{2R} \right] R = \frac{CE}{2}$$

86. (3)

For ideal voltmeter $R = \infty$

$$\text{So, } V_1 = V_2$$

$$i_1 = i_2$$

87. (3)

Let m capacitors are joined in series and n such groups are joined in parallel.

$$\text{So, } C = \frac{8}{m} \text{ and } C_{\text{equivalent}} = n \times \frac{8}{m} = 16$$

$$\text{or } n = 2m$$

$$\text{Potential of arrangement, } mV = 1000$$

$$\text{or } m = \frac{1000}{250} = 4 \therefore n = 2 \times 4 = 8$$

So total number of capacitors required

$$= nm = 8 \times 4 = 32$$

88. (1)

Capacitors C_1 and C_2 are in parallel, their equivalent capacitance is in series with capacitor C_3 .

Hence, the equivalent capacitance of the given circuit is $C_{\text{eq}} = \frac{(C_1 + C_2)C_3}{C_1 + C_2 + C_3}$

Charge on capacitor C_3 is

$$Q = VC_{\text{eq}} = \frac{V(C_1 + C_2)C_3}{C_1 + C_2 + C_3}$$

$$\text{Voltage across } C_3 \text{ is } \frac{Q}{C_3} = \frac{V(C_1 + C_2)}{C_1 + C_2 + C_3}$$

89. (4)

As R_2 , R_3 and R_4 are in series, their equivalent resistance is $R_2 + R_3 + R_4 = 6 \Omega$. Now the 6Ω resistance is in parallel with $R_1 = 2 \Omega$ whose equivalent

resistance will be $\frac{2 \times 6}{2+6} = \frac{3}{2} \Omega$

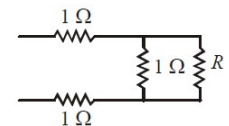
\therefore The current through the circuit,

$$I = \frac{3}{\frac{3}{2}} = 2 \text{ A}$$

90. (3)

The equivalent circuit may be shown as where R may be treated as the total resistance.

$$\text{Hence, } 1 + \frac{1 \times R}{1+R} + 1 = R$$



$$\text{This gives } R = 1 \pm \sqrt{3} \Omega$$

Since, $(1 - \sqrt{3}) \Omega$ gives negative value, therefore $R = (1 + \sqrt{3}) \Omega$