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Ans to the qsn NO: 1

(i)

$C_1 = 10\ MF$

$C_2 = 5\ MF$

$(C_1 \| C_2)$

$C_{123} = (C_1 \| C_2) + C_3$

$= (10 + 5) + C_3$

$= 15 + C_3$

$C_3 = 2.5\ MF$

$15 + C_3$ in series.

$= \left(\frac{1}{15} + \frac{1}{2.5}\right)^{-1}$

$= 2.143\ MF$

Ans

(ii)

$$Q_2 = eV$$

$$= (5 \times 10^{-6}) \left(\frac{2.5}{17.5} \times 14.5 \right)$$

$$= 1.036 \times 10^{-5} \text{ MC}$$

Ans

(ii)

$C_2 = 5 \times 10^{-6}$ F

$q_2 = C_2 V$

$= (5 \times 10^{-6}) \times (14.5)$

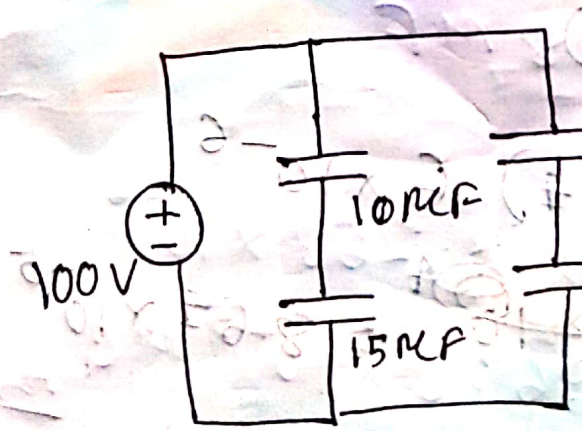
$= 7.25 \times 10^{-5}$ C

Ans.

Qon 4

$V = 100$ V, $C_1 = 10\mu F$, $C_2 = 15\mu F$,

$C_3 = 20\mu F$, $C_4 = 25\mu F$



$$C_{eq} = \frac{10 \times 15}{10 + 15} + \frac{20 \times 25}{20 + 25}$$

$= 17.111\ \mu F$

Ans

Qn 2 (i)

$C_1 = 2.55\ mF$

$V_0 = 6.30\ mV$

$V = 3.79\ mV$

$V_2 = V_0 - V$

$= 6.30 - 3.79$

$= 2.5\ mV$

C_1 transfer fully into C_2

$Q_1 = C_1 V_0$

$= 3.55 \times 6.30$

$= 22.365\ mV$

$C_2 = \frac{Q_1}{V_2}$

$= \frac{22.365}{2.51} = 8.910\ mF$ Ans

Qn 3 (i)

Potential Energy

$$U = \frac{1}{2} \times \frac{q^2}{C}$$

$q = 1.25\,\mu C$

$D = 15.85\,cm = (15.85 \times 10^{-2})\,m$

$$= \frac{1}{2} \times \frac{(1.25 \times 10^{-12})^2}{4\pi\varepsilon_0 \frac{D}{2}}$$

$$= \frac{1}{2} \times \frac{(1.25 \times 10^{-12})^2}{4\pi(8.85 \times 10^{-12}) \times \frac{15.85 \times 10^{-2}}{2}}$$

$$= 8.86 \times 10^{-14}\ J$$

Ans

(ii)

energy density

$$V = \frac{1}{2}\varepsilon_0 E^2$$

$$= \frac{1}{2}\varepsilon_0 \left(\frac{q}{4\pi\varepsilon_0 \frac{D}{2}}\right)^2$$

$$= \frac{1}{2}(8.85\times10^{-12})\left(10^{10}\times\frac{2\times1.25\times10^{-13}}{15.85\times10^{-2}}\right)^2$$

$$= 1.09\times10^{-17}\ Jm^{-3}$$

Ans:

Qn 5

$V = 6V$, $C_1 = 5\mu F$, $C_2 = 9.4\mu F$

(i)

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$$

$$\Rightarrow \frac{1}{C} = \frac{1}{5} + \frac{1}{9.4}$$

$$\Rightarrow \frac{1}{C} = 0.306$$

$$C = 3.268\,\mu F$$

$$\therefore Q = VC = 6 \times 3.268 \times 10^{-6}$$

$$= 1.9608 \times 10^{-5}\,\mu C$$ Ans

(ii)

$$E = \frac{Q^2}{2C}$$

$$= \frac{(1.9608 \times 10^{-5})^2}{2 \times 3.268}$$

$$= 5.8824 \times 10^{-11} \text{ J}$$ Ans