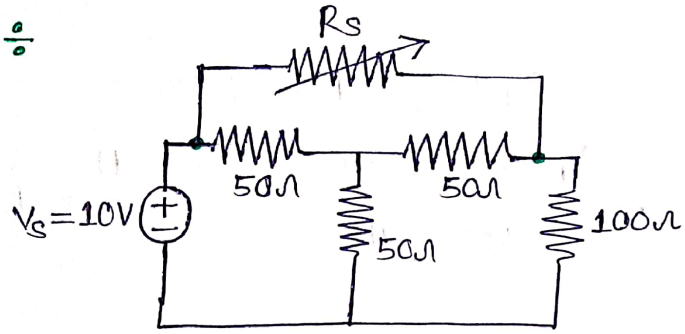
BE Quiz-3 Rubric

SOL(1):-

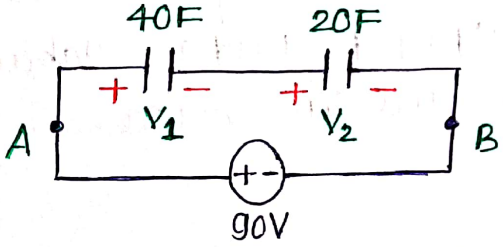


Here for maximum power transfer from the 10V source to the 100Ω load is possible, when the value of variable resistor 'R_S' should be minimum. → (2.5 Point)

∴ Minimum possible value of $R_S = 0\,\Omega$ → (2.5 Point)

SOL(2):-

Case(I):



$(Q = CV)$

at steady state (after long time),

$$V_1 = \left(\frac{20}{40+20}\right)90 = 30 \text{ Volt}$$

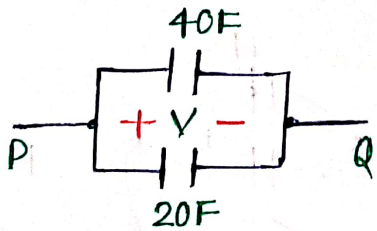
$$V_2 = \left(\frac{40}{40+20}\right)90 = 60 \text{ Volt}$$

Q_1 (charge at 40F) $= 40 \times 30 = 1200\,C$ — (1)

Q_2 (charge at 20F) $= 20 \times 60 = 1200\,C$ — (2)

→ (2 × 2.5 Point)

Case(II):



at steady state (after long time),

$$V = \frac{Q_1}{C_1} = \frac{Q_2}{C_2}$$

$$\frac{Q_1}{Q_2} = \frac{C_1}{C_2} = \frac{40}{20} = 2 \quad \text{— (3)} \qquad \rightarrow \text{(1 Point)}$$

By eqn (1) & (2), we get — $Q_1 + Q_2 = 1200 + 1200$

$$Q_1 + Q_2 = 2400 \quad \text{— (4)} \qquad \rightarrow \text{(1 Point)}$$

By eqn (3) & (4), we get (for case-II)

$$Q_1 = 1600\,C$$

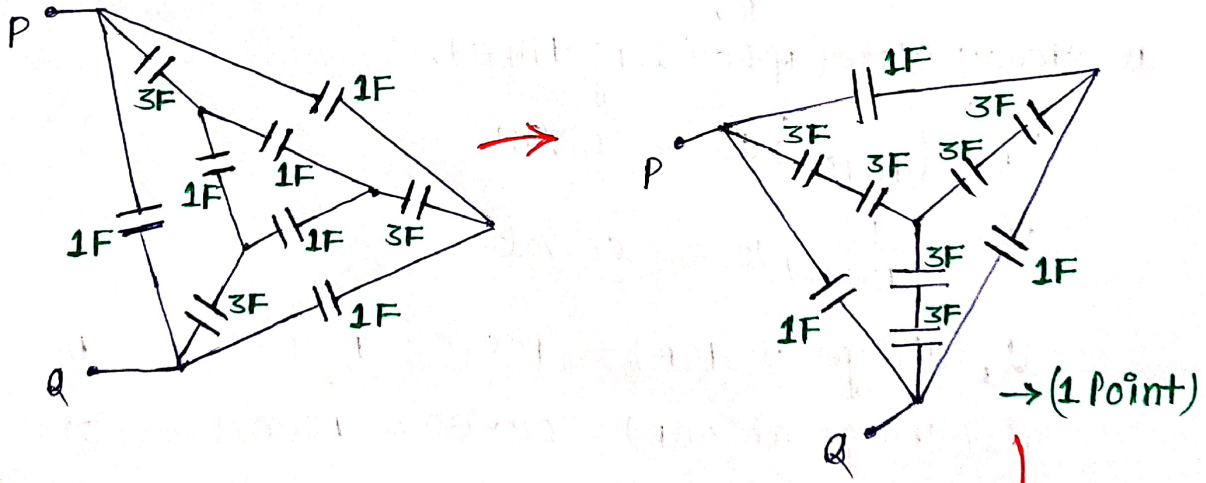
$$Q_2 = 800\,C \qquad \rightarrow \text{(2X0.5 Point)}$$

∴ Voltage across each capacitor in parallel combination,

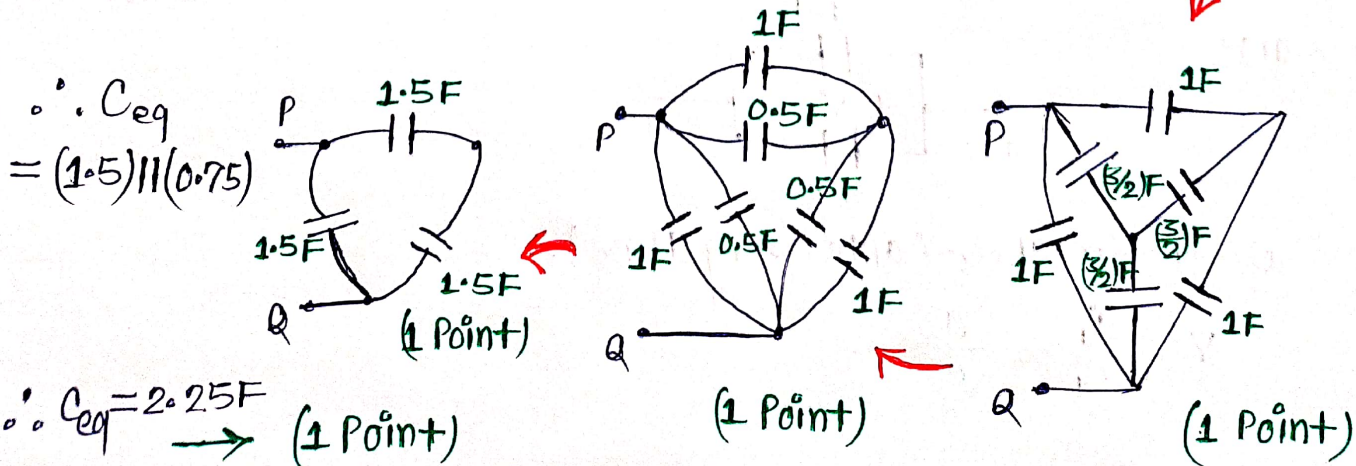
$$V = \frac{Q_1}{C_1} = \frac{Q_2}{C_2}$$

$$= \frac{1600}{40} = \frac{800}{20} = 40 \text{ Volt} \qquad \rightarrow \text{(1 Point)}$$

SOL(3):- As we know that — Capacitors of equal values transformed from Star to Delta, capacitance decrease by 3 times and vice versa.



→ (1 Point)



∴ $C_{eq} = (1.5) \| (0.75)$

(1 Point)

(1 Point)

(1 Point)

∴ $C_{eq} = 2.25F$ → (1 Point)