Chapter 16

99. Charge is the same for series combination, and voltage is the same for parallel combination.

C_1 and C_2 are in parallel: $C_{p1} = C_1 + C_2 = 0.40\ \mu\text{F} + 0.40\ \mu\text{F} = 0.80\ \mu\text{F}$.

C_3 and C_4 are in parallel: $C_{p3} = C_3 + C_4 = 0.20\ \mu\text{F} + 0.60\ \mu\text{F} = 0.80\ \mu\text{F}$.

C_{p1} and C_{p3} are in series: $\dfrac{1}{C_s} = \dfrac{1}{C_{p1}} + \dfrac{1}{C_{p3}}$, $C_s = \dfrac{C_{p1}\,C_{p3}}{C_{p1} + C_{p3}} = \dfrac{(0.80\ \mu\text{F})(0.80\ \mu\text{F})}{0.80\ \mu\text{F} + 0.80\ \mu\text{F}} = 0.40\ \mu\text{F}$.

So the total charge on C_S is $Q_s = C_s V = (0.40\ \mu\text{F})(12\ \text{V}) = 4.8\ \mu\text{C}$.

Therefore, C_{p1} and C_{p3} have the same charge as C_s, which is 4.8 μC.

The voltage across C_{p1} (C_1 and C_2) is $V_1 = \dfrac{Q_{p1}}{C_{p1}} = \dfrac{4.8\ \mu\text{C}}{0.80\ \mu\text{F}} = 6.0\ \text{V}$.

Thus, the charge on C_1 and C_2 is $Q_1 = C_2 = (0.40\ \mu\text{F})(6.0\ \text{V}) = 2.4\ \mu\text{C}$.

The voltage across C_{p3} (C_3 and C_4) is $V_3 = \dfrac{Q_{p3}}{C_{p3}} = \dfrac{4.8\ \mu\text{C}}{0.80\ \mu\text{F}} = 6.0\ \text{V}$.

Thus, the charges on C_3 and C_4 are $Q_3 = (0.20\ \mu\text{F})(6.0\ \text{V}) = 1.2\ \mu\text{F}$, $Q_4 = (0.60\ \mu\text{F})(6.0\ \text{V}) = 3.6\ \mu\text{C}$.

Hence, the answers are $\boxed{C_1\text{: } 2.4\ \mu\text{C}, 6.0\ \text{V};\ C_2\text{: } 2.4\ \mu\text{C}, 6.0\ \text{V};\ C_3\text{: } 1.2\ \mu\text{C}, 6.0\ \text{V};\ C_4\text{: } 3.6\ \mu\text{C}, 6.0\ \text{V}}$.