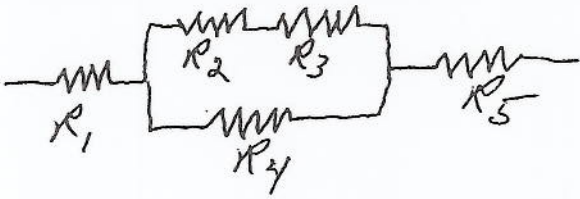


- 1) Consider the circuit element shown. Give the algebraic expression for the effective resistance of this system of resistors. If  $R_1=R_3=R_5=5$  ohms and  $R_2=R_4=3$  ohms, what is the effective resistance? [10 pts]

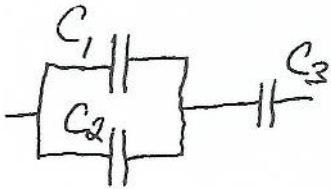


$$R_{23} = R_2 + R_3 = 3 + 5 = 8 \Omega$$

$$R_{234} = \left[ \frac{1}{R_{23}} + \frac{1}{R_4} \right]^{-1} = \left[ \frac{1}{8} + \frac{1}{3} \right]^{-1} = \frac{24}{11}$$

$$R_{eq} = R_1 + R_{234} + R_5 = 5 + \frac{24}{11} + 5 = \boxed{12.18 \Omega}$$

- 2) Consider the circuit element shown. Give the algebraic expression for the effective capacitance of this system of capacitors. If  $C_1=1$  mF and  $C_2=C_3=10$  mF, what is the effective capacitance? [10 pts]



$$C_{12} = C_1 + C_2 = 1 + 10 = 11 \text{ mF}$$

$$C_{eq} = \left[ \frac{1}{C_{12}} + \frac{1}{C_3} \right]^{-1} = \left[ \frac{1}{11} + \frac{1}{10} \right]^{-1} = \boxed{5.24 \text{ mF}}$$