**Q 20.** The three resistances of equal value are arranged in the different combination shown below. Arrange them in increasing order of power dissipation. (2003)



(I)

(II)

(III)

(IV)
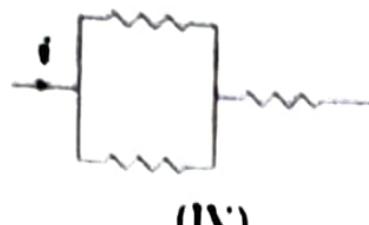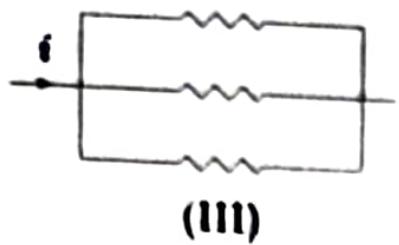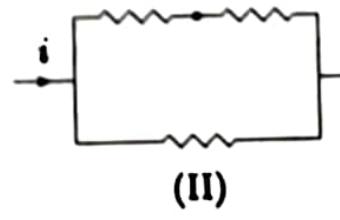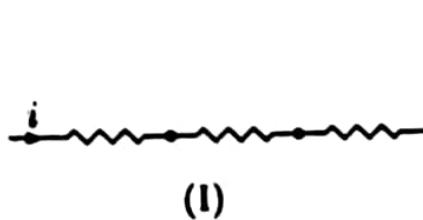
(A) $III < II < IV < I$    (B) $II < III < IV < I$

(C) $I < IV < III < II$    (D) $I < III < II < IV$

**Sol.** The equivalent resistances and power dissipation of the given combination are given by

$$R_1 = R + R + R = 3R, \qquad P_1 = i^2 R_1 = 3i^2 R,$$

$$R_{II} = (R + R) \parallel R = \tfrac{2}{3}R. \qquad P_{II} = i^2 R_{II} = \tfrac{2}{3}i^2 R,$$

$$R_{III} = R \parallel R \parallel R = \tfrac{1}{3}R. \qquad P_{III} = i^2 R_{III} = \tfrac{1}{3}i^2 R.$$

$$R_{IV} = (R \parallel R) + R = \tfrac{3}{2}R. \qquad P_{IV} = i^2 R_{IV} = \tfrac{3}{2}i^2 R.$$

Ans. A ⊡