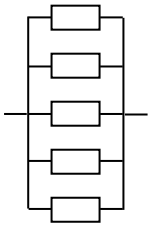
Answer on Question #60612 – Physics – Electric Circuits

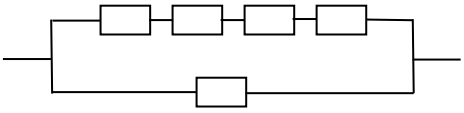
What is the minimum resistance which can be made by using five resistors of 25ohms each

Solution. It is obvious that the parallel connection of conductors has a smaller series resistance. Consider the different connections of conductors and find the final resistance

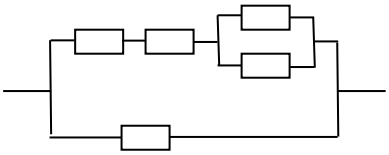
Consider the different connections of conductors and find the final resistance



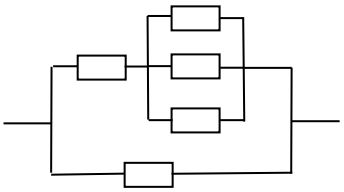
$$\frac{1}{R'}=\frac{1}{R}+\frac{1}{R}+\frac{1}{R}+\frac{1}{R}+\frac{1}{R} \rightarrow R'=5 \text{ ohms}$$



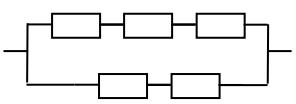
$$\frac{1}{R'}=\frac{1}{R}+\frac{1}{4R} \rightarrow R'=\frac{4}{5}R=20 \text{ ohms}$$



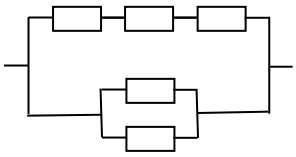
$$\frac{1}{R'}=\frac{1}{\frac{5}{2}R}+\frac{1}{R} \rightarrow R'=\frac{5}{7}R=\frac{125}{7} \text{ ohms}$$



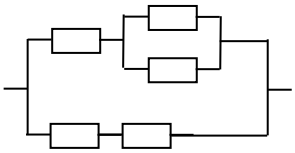
$$\frac{1}{R'}=\frac{1}{\frac{4}{3}R}+\frac{1}{R} \rightarrow R'=\frac{4}{7}R=\frac{100}{7} \text{ ohms}$$



$$\frac{1}{R'}=\frac{1}{3R}+\frac{1}{2R} \rightarrow R'=\frac{6}{5}R=30 \text{ ohms}$$

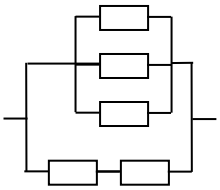


$$\frac{1}{R'}=\frac{1}{3R}+\frac{1}{\frac{1}{2}R} \rightarrow R'=\frac{3}{7}R=\frac{75}{7} \text{ ohms}$$

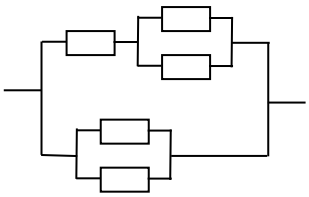


$$\frac{1}{R'}=\frac{1}{2R}+\frac{1}{\frac{3}{2}R} \rightarrow R'=\frac{6}{7}R=\frac{150}{7} \text{ ohms}$$

`



$$\frac{1}{R'}=\frac{1}{2R}+\frac{1}{\frac{1}{3}R} \rightarrow R'=\frac{2}{7}R=\frac{50}{7} \text{ ohms}$$



$$\frac{1}{R'}=\frac{1}{\frac{1}{2}R}+\frac{1}{\frac{3}{2}R} \qquad R'=\frac{3}{8}R=\frac{75}{8} \text{ ohms}$$

Hence the minimum resistance which can be made by using five resistors of 25ohms each equal 5 ohms.

Answer: Minimum resistance 5ohms.