2023 Ph H1 Q20

Section: Electricity

Topic: Current, PD, Power, Resistance

Question Summary
Six 36 Ω resistors form three parallel branches between X and Y. Top and bottom branches each have two 36 Ω in series; the middle branch has two 36 Ω in parallel. Find the total resistance between X and Y.

Worked Solution
Top branch (series): 36 + 36 = 72 Ω.
Middle branch (parallel): (36 × 36) / (36 + 36) = 1296 / 72 = 18 Ω.
Bottom branch (series): 36 + 36 = 72 Ω.

These three branches are in parallel, so:
$1/R_{XY} = 1/72 + 1/18 + 1/72 = (1 + 4 + 1)/72 = 6/72 = 1/12$.
Therefore $R_{XY} = 12$ Ω.

Final Answer: C

Revision Tips

- Combine series resistors by addition; combine parallel branches using reciprocals.

- Two equal resistors in parallel halve the resistance (36 Ω || 36 Ω → 18 Ω).

- When several branches are in parallel, add their conductances: $1/R_{total} = \Sigma(1/R_{branch})$.