Part (b)(i)

Game plan: We use Prim's algorithm, starting at A. At each step, we add the shortest edge joining a telephone already in the tree to a telephone outside it.

Step 1: Grow the tree from telephone A

For each telephone still outside the tree, the table lists its shortest available connection to the current tree. The chosen connection is bold.

Step	Current tree	Shortest available connections	Added
1	A	$\boldsymbol{AB = 9}$, $AC = 14$, $AD = 13$, $AE = 12$, $AF = 15$, $AG = 18$	9
2	A, B	$BC = 13$, $AD = 13$, $AE = 12$, $\boldsymbol{BF = 9}$, $BG = 15$	9
3	A, B, F	$BC = 13$, $FD = 9$, $FE = 11$, $\boldsymbol{FG = 8}$	8
4	A, B, F, G	$BC = 13$, $\boldsymbol{FD = 9}$, $FE = 11$	9
5	A, B, F, G, D	$DC = 11$, $\boldsymbol{DE = 10}$	10
6	A, B, F, G, D, E	$\boldsymbol{DC = 11}$	11

At step 3, for example, adding F has made the 8 m edge FG available. We choose that edge next because it is the shortest edge leaving the tree.

Step 2: Add the six selected lengths

There are seven telephones, so the completed spanning tree has six edges:

$$AB,\ BF,\ FG,\ FD,\ DE,\ DC.$$

Their total length is

$$9 + 9 + 8 + 9 + 10 + 11 = 56 \text{ m}.$$

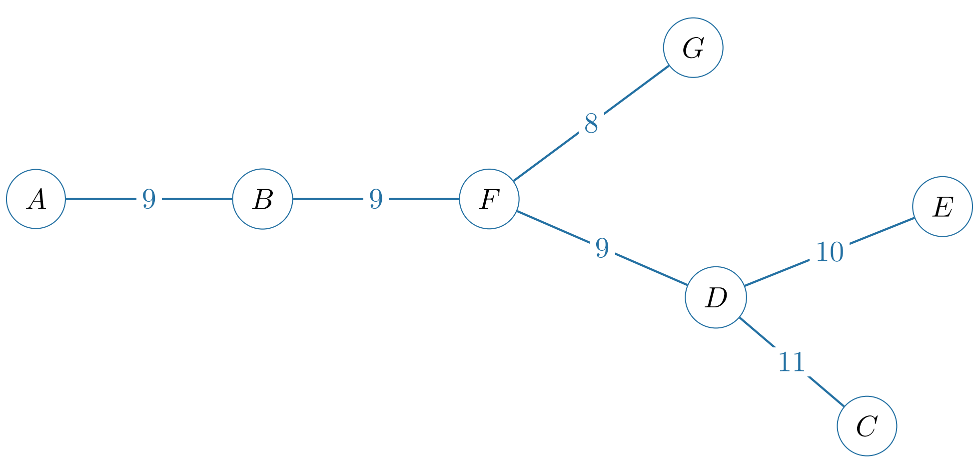
Final Answer

The minimum cable length is **56 m**.

Part (b)(ii)

Game plan: We draw the seven telephones and only the six edges selected by Prim's algorithm.

Step 1: Draw the minimum spanning tree



Every telephone is connected to the same network, and there are no cycles. Edge labels are lengths in metres.

Final Answer

The required network is the tree shown above, using $\boldsymbol{AB, BF, FG, FD, DE}$ **and** $\boldsymbol{DC}$.