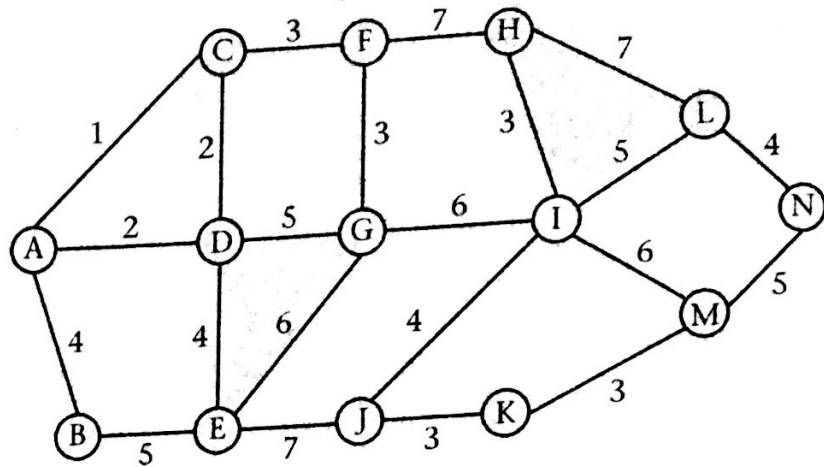


Write down the relationship between ...

6 A company is to install power lines to buildings on a large industrial estate. The lines are to be laid by the side of the roads on the estate. The estate is shown as a network opposite. The buildings are designated A, B, C, ..., N and the distances between them are given in hundreds of metres. The manager wants to minimise the total length of power line to be used.

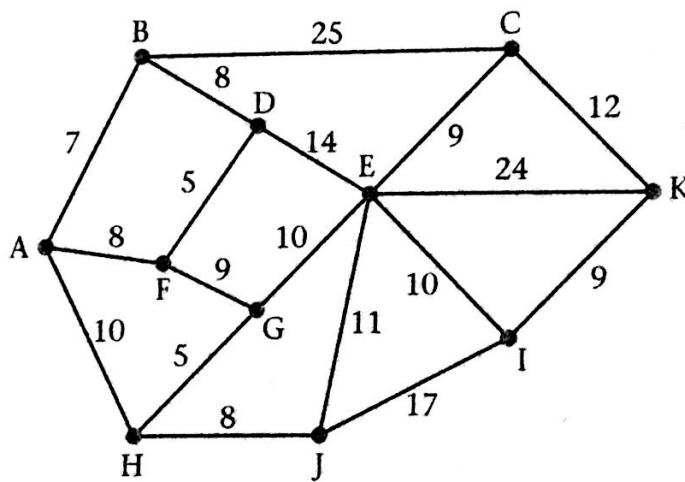


a Use Kruskal's algorithm to obtain a minimum spanning tree for the network and hence determine the minimum length of power line needed.

Owing to a change of circumstances, the company modifies its plans for the estate. The result is that the road from F to G now has a length of 700 metres.

b Determine the new minimum total length of power line.

7 *



A weighted network is shown above. The number on each arc indicates the weight of that arc.

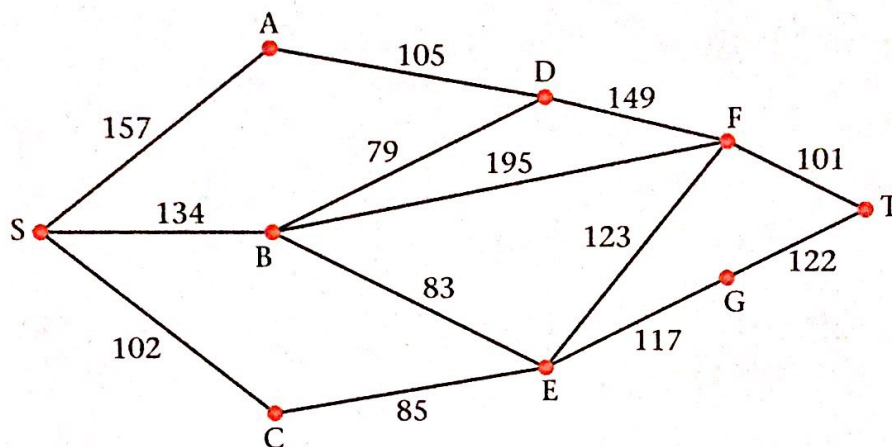
a Use Dijkstra's algorithm to find a path of least weight from A to K.

State clearly

- i** the order in which the vertices were labelled,
 - ii** how you determined the path of least weight from your labelling.
- b** List all alternative paths of least weight.
- c** Describe a practical problem that could be modelled by the above network and solved using Dijkstra's algorithm.

E

8 *



The network above shows the distances, in miles, between nine cities. Use Dijkstra's algorithm to determine the shortest route, and its length, between cities S and T. You must indicate clearly

- i** the order in which the vertices are labelled,
- ii** how you used your labelled diagram to decide which cities to include in the shortest route.

E

d weight = 4 / so 4/00 III

7 a i Possible paths are A - H - G - E - I - K } anyone
and A - H - J - I - K } accepted
and A - B - C - K

ii $44 - 9 = 35$ IK $44 - 9 = 35$ IK
 $35 - 10 = 25$ EI $35 - 17 = 18$ JI
 $25 - 10 = 15$ GE *or* $18 - 8 = 10$ HJ
 $15 - 5 = 10$ HG $10 - 10 = 0$ AH
 $10 - 10 = 0$ AH

or

$44 - 12 = 32$ CK
 $32 - 25 = 7$ BC
 $7 - 7 = 0$ AB

b A - H - G - E - I - K and A - H - J - I - K
and A - B - C - K

c The arcs could be roads.

The nodes could be junctions.

The number on each arc could be distance in km.

The network, together with Dijkstra's algorithm,
could be used to find the shortest route from A to K.

8 Order of vertex labelling:

S C B A E D G F T

Route: S - C - E - F - T

$411 - 101 = 310$ FT

$310 - 123 = 187$ EF

$187 - 85 = 102$ CE

$102 - 102 = 0$ SC