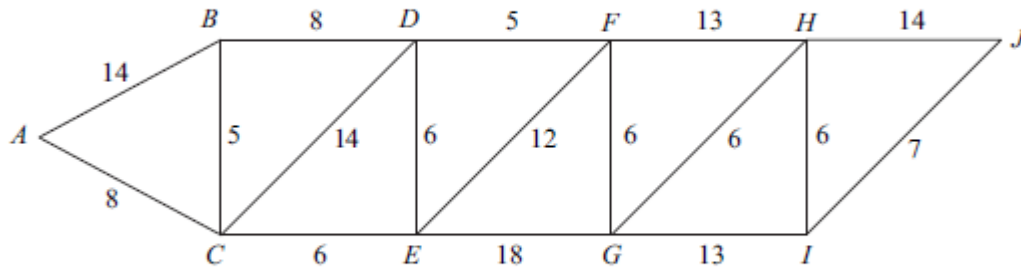


Decision 1 Shortest Path Questions

5 [Figure 1, printed on the insert, is provided for use in this question.]

The network shows the times, in minutes, to travel between 10 towns.



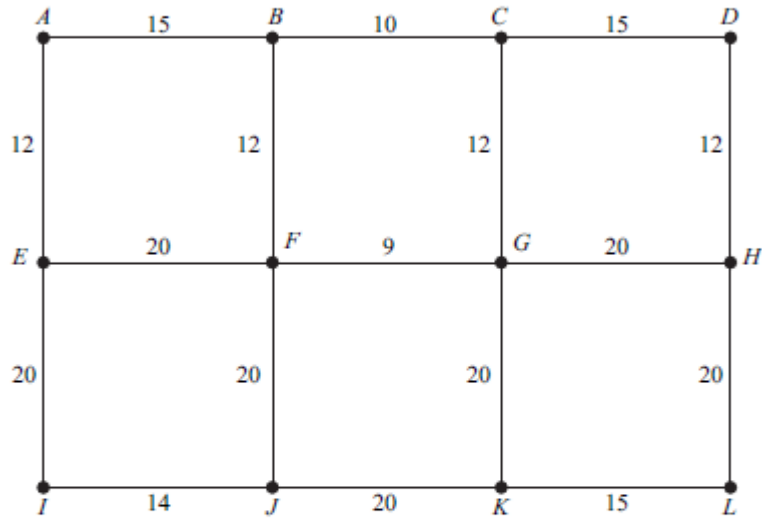
- (a) Use Dijkstra's algorithm on **Figure 1** to find the minimum time to travel from *A* to *J*.
(6 marks)
- (b) State the corresponding route.
(1 mark)
-

7 A connected graph **G** has m vertices and n edges.

- (a) (i) Write down the number of edges in a minimum spanning tree of **G**. (1 mark)
- (ii) Hence write down an inequality relating m and n . (2 marks)
- (b) The graph **G** contains a Hamiltonian cycle. Write down the number of edges in this cycle. (1 mark)
- (c) In the case where **G** is Eulerian, draw a graph of **G** for which $m = 6$ and $n = 12$. (2 marks)
-

3 [Figure 1, printed on the insert, is provided for use in this question.]

The following network represents the footpaths connecting 12 buildings on a university campus. The number on each edge represents the time taken, in minutes, to walk along a footpath.



(a) (i) Use Dijkstra's algorithm on **Figure 1** to find the minimum time to walk from *A* to *L*. (7 marks)

(ii) State the corresponding route. (1 mark)

(b) A new footpath is to be constructed. There are two possibilities:

from *A* to *D*, with a walking time of 30 minutes; or

from *A* to *I*, with a walking time of 20 minutes.

Determine which of the two alternative new footpaths would reduce the walking time from *A* to *L* by the greater amount. (3 marks)

