



Eastern Goldfields College

Student Name

Marking Key

Eastern Goldfields College Mathematics Applications U3&4 2016

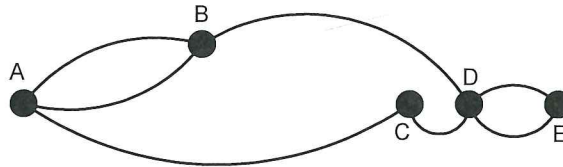
Test 3 – Calculator Assumed Section

Working Time: 20 minutes

Total Marks: 17 marks

Question 1 [4 marks: 2, 2]

Consider the following undirected graph.



a) Construct the adjacency matrix, M , for the above digraph.

$$M = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 2 \\ 0 & 0 & 0 & 2 & 0 \end{bmatrix} \end{matrix}$$

✓✓ -1 Error

b) Calculate M^2 and explain the significance of the zero elements in this matrix.

$$M^2 = \begin{bmatrix} 5 & 0 & 0 & 3 & 0 \\ 0 & 5 & 3 & 0 & 2 \\ 0 & 3 & 2 & 0 & 2 \\ 3 & 0 & 0 & 6 & 0 \\ 0 & 2 & 2 & 0 & 4 \end{bmatrix}$$

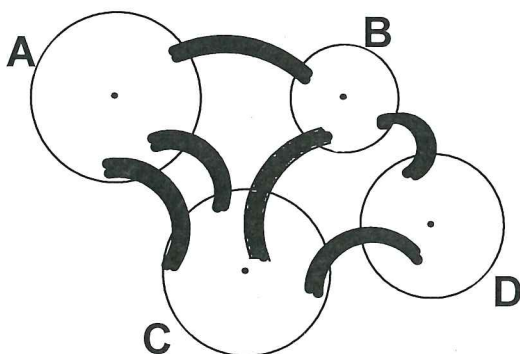
0 means there is no path, of length 2, between the 2 vertices.

e.g. $A \rightarrow B = 0 \rightarrow$ No path of length 2, from A to B.

Question 2 [2 marks]

Is it possible to construct a traversable network through the following diagram of islands and bridges?

If your answer is no, justify your solution and add one extra bridge which would make the network traversable. If your answer is yes, clearly show the traversable path.



Yes

A - C - D - B - C - A - B

Start = A or B (odd)

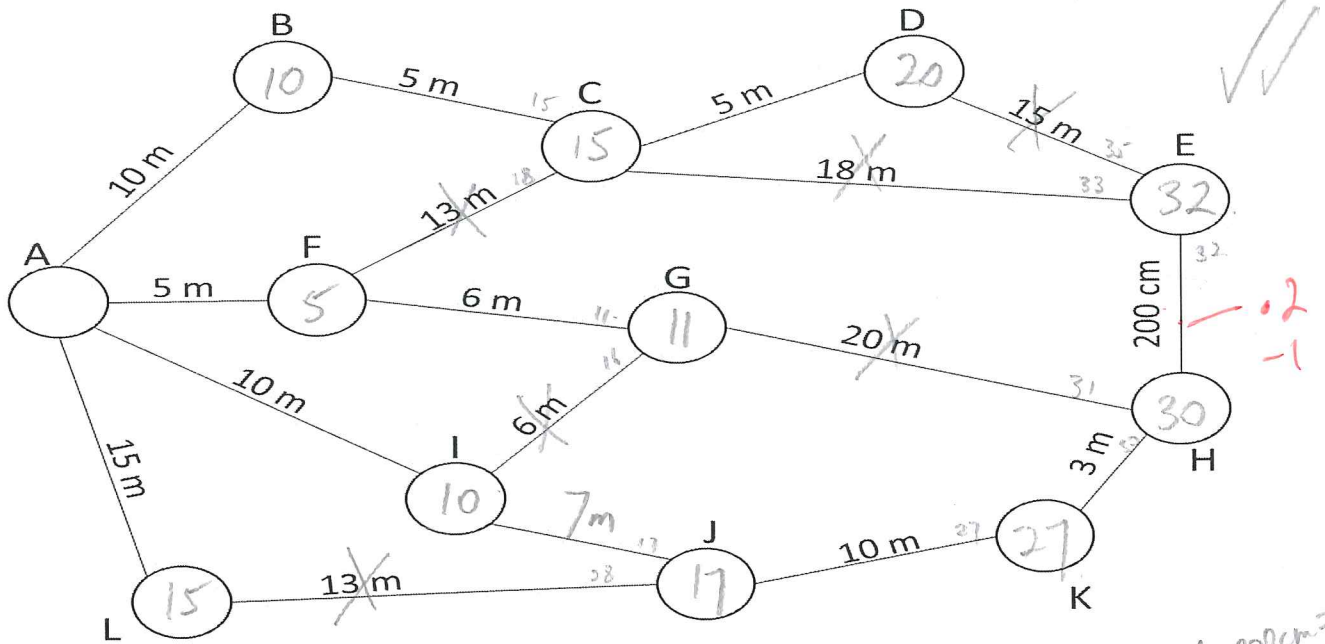
need to follow

End = B or A (odd)

Question 3 [11 marks – 4, 1, 6]

The following network shows some of the corridors running through a large hospital. Most of the thoroughfare through this hospital is from A to E.

The hospital receives some funding to upgrade some of the finishings in the corridors. In order to maximise their budget they decided to upgrade the shortest path from A to E as these would be the most used corridors. The cost of upgrading is \$95/metre.



- a) What is the shortest distance from A to E and what is this pathway?

$$A - 1 - J - K - H - E = 32 \text{ km}$$

- b) What is the cost of upgrading the shortest path from A to E?

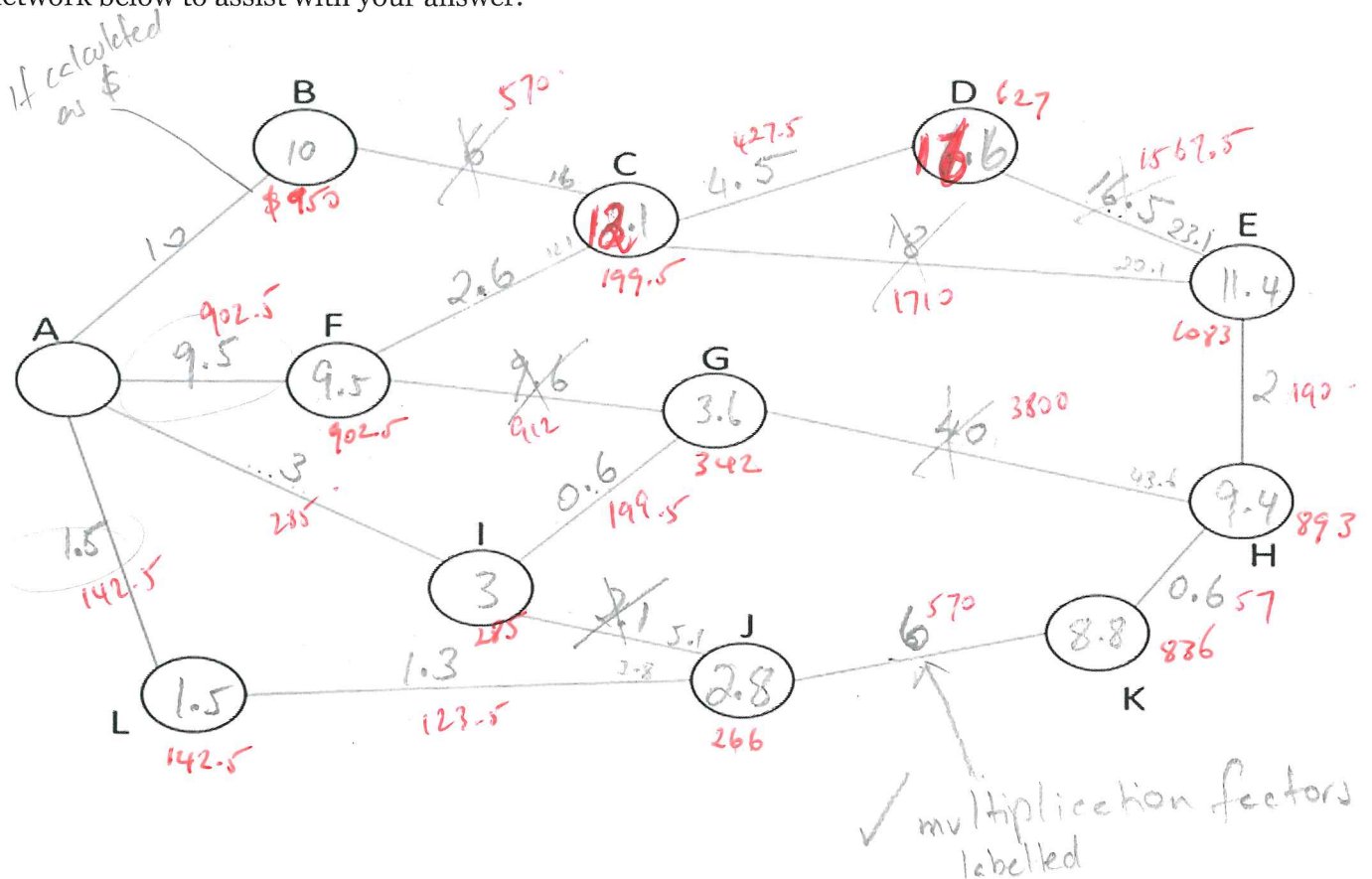
$$32 \times 95 = \$3040$$

If $200\text{cm} = 0.2$
 30.2ft
 30.2×95
 $= 2869$
 ft

Upon further discussions it appears that not all the corridors require the same amount of work to upgrade and therefore the costs of upgrading each corridor are not equal. The following table shows the multiplication factor in the costs of upgrading each corridor relative to the lengths.

[illegible]

- c) Taking into account the multiplication factors, which path from A to E should the hospital upgrade in order to minimise costs? Clearly state this path and the total cost of upgrading it. Use the blank network below to assist with your answer.



Path to minimise costs

$$A - L - J - K - H - E = 11.4$$

$$11.4 \times 95 = \$1083$$

✓✓ shortest path calculation
-1 Error

- If \$, or mult factor written (eg A-B student wrote \$950) or 1 then -1 or mult factor x f.t. error from there.
- If shortest path not written (eg. A-L-J-K-H-E) -1 or x.
- If length of shortest path not written (eg. 11.4) -1 or x.
- If final cost not written then -1 or x.
- 2 answers = 0/6.

END OF TEST