Module 2 – Networks and decision mathematics

Question 1 E

Many of the options have the correct set of edges between different vertices. Options **B** and **E** are different in that they also have a loop at vertex *A*.

Option **E** is similar to option **B**, but treats vertex *A*'s loop as 2 edges. This is correct as both ends of the edge must be counted.

Question 2 C

To have an Eulerian circuit, all vertices must have an even degree.

Options **A**, **B** and **D** all have 2 odd vertices. Option **E** has 4 odd vertices. Only option **C** has all even vertices.

Question 3 D

Options **A** and **B** are not trees as they contain circuits. Option **C** is not spanning as 1 vertex is not connected. Option **E** contains edges not present in the original graph.

Question 4 B

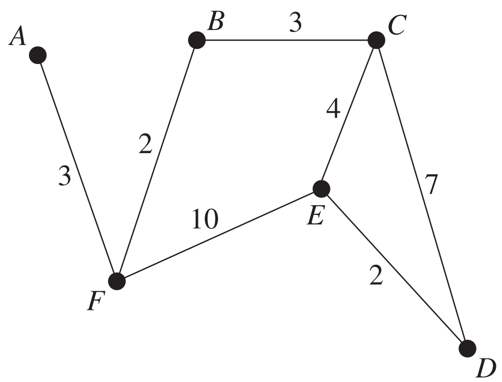
The sum of the vertices of any graph must be even. The answer is clear from this. The only other possible consideration is whether the graph has enough edges, but that is not a problem as the question does not state that the graph is connected.

Question 5 B

Edges can be removed when a shorter, equal-length path exists between the vertices at each end. Thus *FD* can be removed as travelling *FED* is the same.

Likewise, *AB* can be discarded as *AFB* is shorter. On the same basis, *BE* is removed in favour of *BCE*.

The graph below shows the result after this is done.



FE can now be removed as *FBC* is shorter, and *CD* is removed as *CED* is shorter.

The best path is now clearly *AFBCED*, a length of 14.

Question 6 E

Use $V + f = e + 2$.

If V and f increase by a total of 5, then $e + 2$ must also increase. Thus e increases by 5.