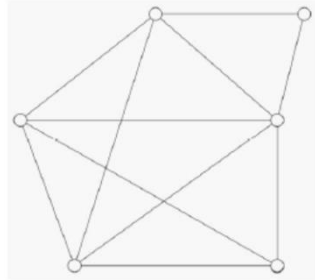




Question 1

The number of faces in the network diagram shown is

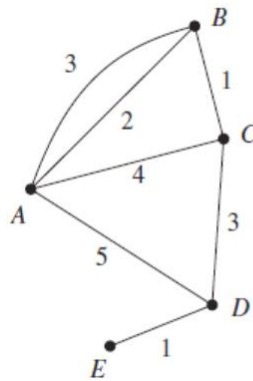
- A. 7
- B. 8
- C. 9
- D. 10
- E. 11



Question 2

The degree of Vertex A is:

- A. 4
- B. 7
- C. 14
- D. 15
- E. 19



Question 3

The adjacency matrix for a graph is shown below:

$$\begin{bmatrix} 0 & 1 & 2 & 0 \\ 1 & 1 & 0 & 0 \\ 2 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Which of the following is **not** true for this graph:

- A. There are loops on two of the vertices.
- B. One of the vertices is isolated.
- C. There are eight edges on this graph.
- D. This graph contains multiple edges.
- E. There are four vertices on this graph.

Question 4



The least number of edges that need to be added to the graph above in order to make a spanning tree is:

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

Question 5

A simple graph has 8 edges. The sum of the degrees of the vertices for this graph is:

- A. 7
- B. 8
- C. 14
- D. 16
- E. 28

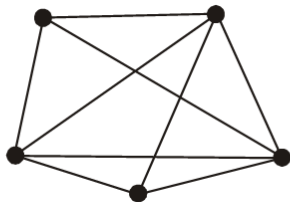
Question 6

A connected planar graph has equal number of vertices and regions (faces).

The number of edges in this graph is equal to:

- A. the number of regions
- B. twice the number of regions
- C. half the number of regions
- D. twice the number of regions minus two
- E. half the number of regions plus two

Question 7



The graph shown above could **not** be described as

- A. planar
- B. simple
- C. connected
- D. complete
- E. undirected

Question 8

A store manager is directly in charge of two department managers. Each department manager is directly in charge of three sales people in their department.

a. Draw a graph that represents this staffing structure.

b. Of the following list which describes this type of graph?

A tree

A circuit

An Euler trail

A Hamiltonian path

A complete graph

2 + 1 = 3 marks

Question 9

In a town there are five friends: Paul, Ben, Kevin, Matt and David. The friends' houses are linked by the number of footpaths given in the matrix below.

$$\begin{bmatrix} 0 & 2 & 1 & 0 & 1 \\ 2 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 0 \end{bmatrix}$$

Due to an oversight, the names of all of the friends were not listed with the rows and columns; however, the following information is known:

- Ben and Paul have two footpaths between their houses
- There is only one path between Kevin and each of his friends
- Paul and David have one path linking their houses
- The second column in the matrix represents Paul's edges

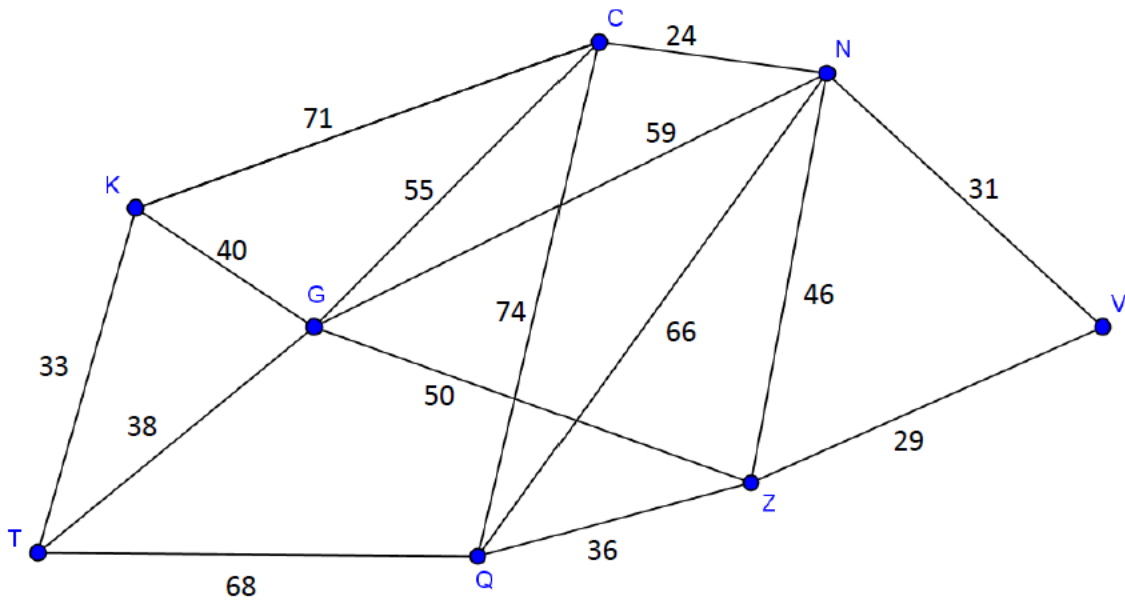
a. Draw the network showing all footpaths and houses.

b. On the matrix above label each column with the initial of the person.

3 + 2 = 5 marks

Question 10

In the network shown, numbers on the edges give distances in kilometres between corresponding towns.



- a. Find the minimum spanning tree and give its total length. Highlight the spanning tree on the diagram above.

- b. Find the shortest route from T to V and state the distance travelled via this route.

- c. A commercial traveller wants to visit all the **towns**, starting and finishing at T, without using a road more than once. List a possible sequence of towns that he could use.

- d. A road inspection crew is given the task of checking all roads for potholes. This requires them to travel on all roads in the network. Explain why this is not possible without travelling along at least one of the roads twice.

- e. Describe a route that would allow the crew to inspect all the roads.
