Year 12 Mathematics
ATMAA UNIT 3 APPLICATIONS TEST 3
Graphs and Networks Calculator Assumed

Name:_____ Date:_____

Mark	/40

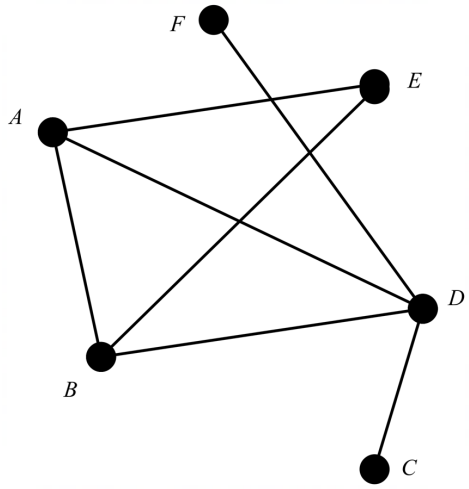
Time Allowed: 30 minutes

Resources Allowed: Scientific Calculator, 1 side A4 notes. Formula sheet provided.

Solutions without working may not be allocated full marks.

Question One **[20 marks]**

Use the network *Z* below to answer the following questions.



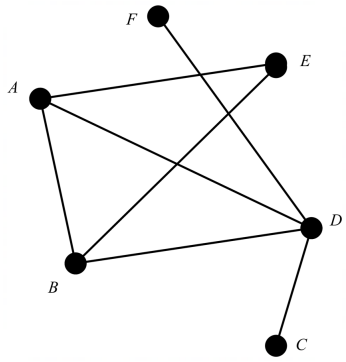
a) Write the sum of degrees for the network *Z*. (1 marks)

b) Could network *Z*, be described as an Eulerian graph or a Hamilitonian graph? Justify your answer. (4 marks)

c) Clearly highlight any bridges that exist in the network. Justify your anwer. (3 marks)

d) Find the value x and y in the expression below. (2 marks)

$$Z + Z^2 = \begin{matrix} \\ A \\ B \\ C \\ D \\ E \\ F \end{matrix} \begin{matrix} \begin{bmatrix} A & B & C & D & E & F \end{bmatrix} \\ \begin{bmatrix} 3 & & & & & \\ 3 & y & & & & \\ 1 & 1 & 1 & & & \\ 2 & 2 & 1 & 4 & & \\ 2 & 2 & x & 2 & 2 & \\ 1 & 1 & 1 & 1 & 0 & 1 \end{bmatrix} \end{matrix}$$



e) What does the value of 4 in the matrix mean in the context of the the given network? (3 marks)

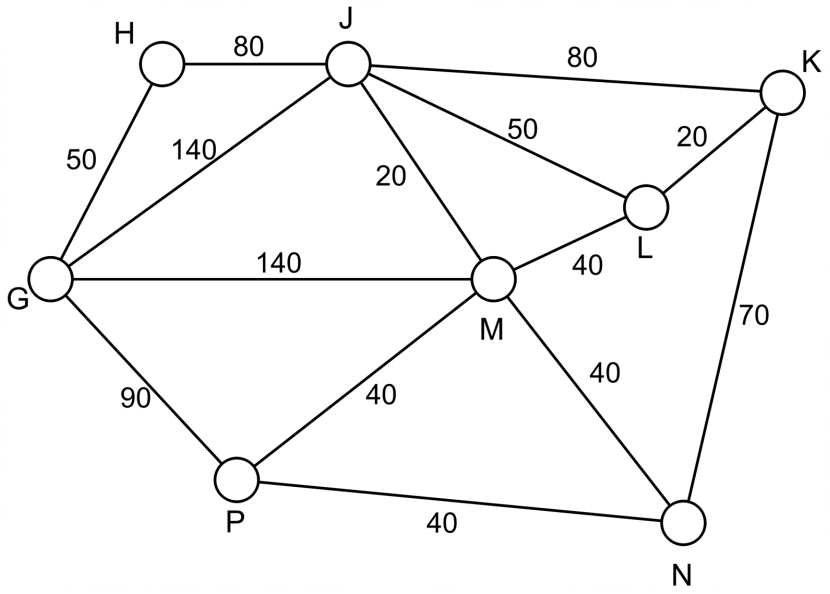
f) Given matrix *P* represents a planar graph. Calculate the number of regions in the network. (3 marks)

$$P = \begin{matrix} \\ W \\ X \\ Y \\ Z \end{matrix} \begin{matrix} \begin{bmatrix} W & X & Y & Z \end{bmatrix} \\ \begin{bmatrix} 0 & 0 & 2 & 1 \\ 0 & 0 & 1 & 1 \\ 2 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix}$$

g) Draw the planar graph represented by matrix P. (4 marks)

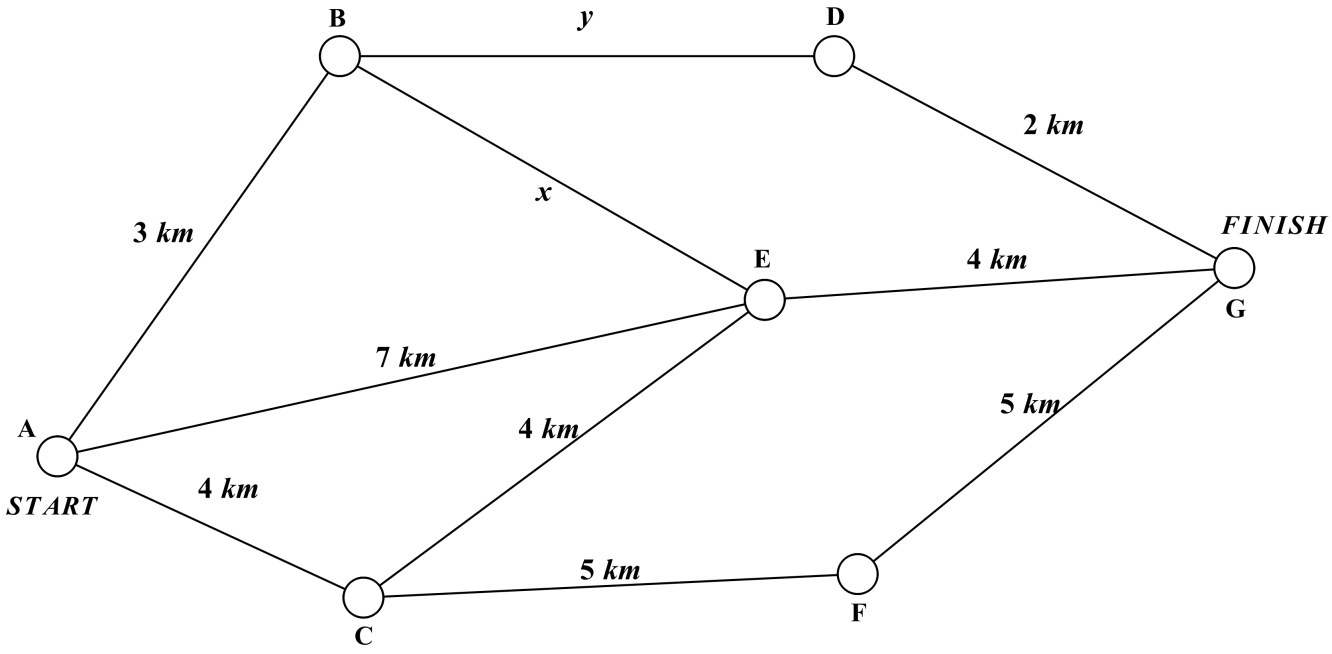
Question Two **[11 marks]**

a) 8 towns are connected by sealed roads. Determine the shortest journey from town G to K. (4 marks)



b) The road joining town N and town K improves and it is shortened by 10km. Comment in detail how this will impact the shortest journey from town G to K. (3 marks)

This is a network showing businesses connected in town J.



c) If the shortest path/s from start to finish is 9 km, state all possible values for x and y and the possible shortest path/s. (4 marks)

Question Three [9 marks]

A network H is a tree with 7 vertices; A, B, C, D, E, F, G

a) Draw network H as a Semi-Eulerian trail and a Semi-Hamilitonian walk. Clearly write the Semi-Hamilitonian walk starting at vertex D. (4 marks)

If network H can be changed into network P with 7 vertices; A, B, C, D, E, F, G.

b) Network P is a planar non-simple graph with a Eulerian cycle, one loop, and it has 3 regions. Draw network P below. Clearly outline the Eulerian cycle as a walk starting at vertex A. (5 marks)

END OF SECTION TWO

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