

5 paths



# GENERAL MATHEMATICS 2024

## Unit 4

### Key Topic Test 5 – Network and Decision Mathematics: Introduction to Graphs

Recommended writing time\*: 45 minutes

Total number of marks available: 25 marks

## SOLUTIONS

**SECTION A – Multiple Choice (1 mark per question)**

**Question 1**

*Answer:* C

$$3 + 2 + 2 + 5 + 1 + 1 = 14$$

**Question 2**

*Answer:* B

There are 4 odd degree vertices. Adding one edge that connects 2 of the existing odd degree vertices would create a Eulerian trail.

**Question 3**

*Answer:* D

$$\begin{aligned}v + f - e &= 2 \\6 + f - 10 &= 2 \\f &= 6\end{aligned}$$

**Question 4**

*Answer:* E

A Hamiltonian circuit does not exist

**Question 5**

*Answer:* C

DE is a bridge, if it was removed, the graph would not be connected

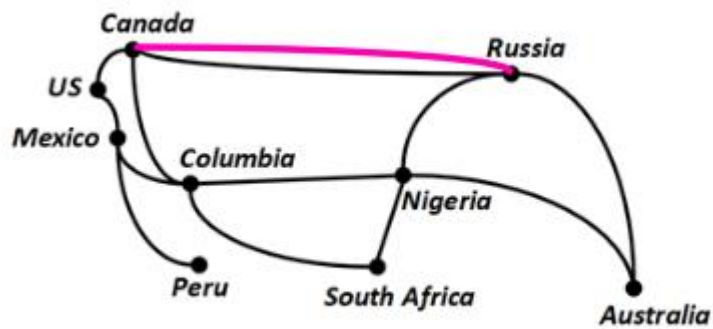
**SECTION B – Short Answer**

**Question 1**

- a. Nigeria = degree 4

1 mark

- b. The flight must connect the other 2 odd degree vertices (not Mexico or Peru)



- c. Eulerian trail

1 mark

- d. 5

Any country with degree  $\geq 3$

1 mark

- e. Mexico – US – Canada – Russia – Canada – Columbia – Nigeria – Russia – Australia – Nigeria – South Africa – Columbia – Mexico – Peru

\*note there are multiple solutions

1 mark

**Question 2**

- a. Deg (BBQ) = 4

1 mark

- b.

Number of edges	12
Number of vertices	9
Number of faces	5

$$12 + 5 - 9 = 2$$

2 marks

- c. Hamiltonian path

1 mark

## 2024 GENERAL MATHEMATICS KEY TOPIC TEST

**d.** Entry – office – car park – camping – BBQ – playground – pool – cabins – toilet

\*note multiple solutions exist

1 mark

**e.** 4 odd degree vertices

1 mark

**f.** Entry or office (odd degree)

2 marks

**g.** Office – car park – camping – BBQ – playground – pool – cabins – toilet – pool – BBQ – toilet – camping – office – entry

\*note multiple solutions exist

1 mark

**h.** Entry to the office

1 mark

**i.** Eulerian circuit

1 mark

### Question 3

**a.**

$$\begin{array}{cccc} a & b & c & d \\ \left[ \begin{array}{cccc} 0 & 3 & 0 & 2 \\ 3 & 0 & 1 & 1 \\ 0 & 1 & 1 & 2 \\ 2 & 1 & 2 & 0 \end{array} \right] & \begin{array}{l} a \\ b \\ c \\ d \end{array} \end{array}$$

2 marks

**b.** 5

1 mark

**c.**  $\text{Deg}(C) = 5$

1 mark

**END OF KEY TOPIC TEST SOLUTIONS**