**MATHEMATICS APPLICATIONS**

**MAWA Semester 1 (Unit 3) Examination 2016**

**Calculator-free**

# Marking Key

**Section One: Calculator-free (50 Marks)**

**Question 1 (a)**

|  |  |
| --- | --- |
| Solution  The worker determined the degree of each vertex and concluded that the network had no odd vertices. | |
| Marking key/mathematical behaviours | Marks |
| * determines degree of each vertex * identifies there are no odd vertices | 1  1 |

**Question 1 (b)**

|  |  |
| --- | --- |
| Solution  Eulerian. | |
| Marking key/mathematical behaviours | Marks |
| * identifies type of trail | 1 |

**Question 1 (c)**

|  |  |
| --- | --- |
| Solution  T A B E F B C D B H G F H T (or reverse order)  T A B C D B H G F B E F H T (or reverse order) | |
| Marking key/mathematical behaviours | Marks |
| * lists first seven vertices in correct order * lists remaining seven vertices in correct order | 1  1 |

**Question 2 (a)**

|  |  |
| --- | --- |
| Solution  The relationship is weak. The correlation coefficient is about 0.45 OR the data points do not form a close linear pattern. | |
| Marking key/mathematical behaviours | Marks |
| * describes the strength of the linear relationship * justifies conclusion | 1  1 |

**Question 2 (b)**

|  |  |
| --- | --- |
| Solution  (i) There would be about 10 burglaries  (ii) As the number of assaults increases by 1 the number of burglaries decreases by 1. | |
| Marking key/mathematical behaviours | Marks |
| * interprets the y-intercept * describes the change as negative * identifies the rate of change as 1 for 1 [1 mark for each value] | 1  1  2 |

**Question 3 (a)**

|  |  |
| --- | --- |
| Solution | |
| Marking key/mathematical behaviours | Marks |
| * identifies correct edges for Town 7 * identifies correct edges for Town 8 * identifies correct edges for Town 9 | 1  1  1 |

**Question 3 (b)**

|  |  |
| --- | --- |
| Solution  (i) when it can be drawn on a sheet of paper without any edges crossing  (ii) | |
| Marking key/mathematical behaviours | Marks |
| * describes planarity * connects all towns with their respective services * draws network without any edges crossing | 1  1  1 |

**Question 3(c)**

|  |  |
| --- | --- |
| Solution    (i) Bank  (ii) Graph showing direct edge from Town 9 to the bank.      It is impossible to draw an edge from Town 9 to the bank without crossing another edge | |
| Marking key/mathematical behaviours | Marks |
| * (i) designates that a bank is the additional service * (ii) draws a graph showing edge from Town 9 to bank * draws with correct edges crossing | 1  1  1 |

**Question 4 (a)**

|  |  |
| --- | --- |
| Solution  Letters A, C and D should be circled | |
| Marking key/mathematical behaviours | Marks |
| * selects one correct feature * selects second correct feature * selects third correct feature (only selecting 3) | 1  1  1 |

**Question 4 (b)**

|  |  |
| --- | --- |
| Solution  Cannot travel every edge only once AND start and finish at same vertex | |
| Marking key/mathematical behaviours | Marks |
| * describes first condition * describes second condition | 1  1 |

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**Question 4 (c)**

|  |  |
| --- | --- |
| Solution  Euler’s Rule : n(vertices) + n(faces) – n(edges) = 2  5 + 3 – 6 = 2 | |
| Marking key/mathematical behaviours | Marks |
| * states Euler’s Rule * substitutes correct number of vertices, faces and edges | 1  1 |

**Question 4 (d)**

|  |  |
| --- | --- |
| Solution  Graph is still connected when edge PQ is removed | |
| Marking key/mathematical behaviours | Marks |
| * explains graph remains connected * when edge PQ removed | 1  1 |

**Question 4 (e)**

|  |  |
| --- | --- |
| Solution  The degree of vertex R is **3** because **exactly** **3 edges meet at R** . | |
| Marking key/mathematical behaviours | Marks |
| * identifies degree of node * justifies choice of value | 1  1 |

**Question 5 (a)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Solution   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Number of hours pump was working | 1 | 2 | 3 | 5 | 6 | | Volume of water in the tank (in litres) | 360 | 560 | 760 | 1160 | 1360 | | |
| Marking key/mathematical behaviours | Marks |
| * determines starting value and third term * determines 5th term * identifies term number | 1  1  1 |

**Question 5 (b)**

|  |  |
| --- | --- |
| Solution  760 litres | |
| Marking key/mathematical behaviours | Marks |
| * relates sequence to context of problem | 1 |

**Question 5 (c)**

|  |  |
| --- | --- |
| Solution  200 = 360 | |
| Marking key/mathematical behaviours | Marks |
| * describes recursive relation * identifies starting term (or any particular term) | 1  1 |

**Question 5 (d)**

|  |  |
| --- | --- |
| Solution  Linear. The increase is a constant number | |
| Marking key/mathematical behaviours | Marks |
| * identifies correct relationship * justifies choice of type | 1  1 |

**Question 5 (e)**

|  |  |
| --- | --- |
| Solution  1960 | |
| Marking key/mathematical behaviours | Marks |
| * identifies correct term (n = 9) * determines correct value | 1  1 |

**Question 5 (f)**

|  |  |
| --- | --- |
| Solution  18 hours | |
| Marking key/mathematical behaviours | Marks |
| * identifies correct term | 1 |

**Question 6 (a)**

|  |  |
| --- | --- |
| Solution  6 | |
| Marking key/mathematical behaviours | Marks |
| * identifies Hamiltonian circuits | 1 |

**Question 6 (b)**

|  |  |
| --- | --- |
| Solution  WXYZW or WZYXW 63 km | |
| Marking key/mathematical behaviours | Marks |
| * identifies shortest circuit * determines length of shortest circuit | 1  1 |

**Question 6 (c)**

|  |  |
| --- | --- |
| Solution  It goes through each vertex only once  It starts and ends at the same vertex | |
| Marking key/mathematical behaviours | Marks |
| * identifies cyclic nature * describes path though vertices | 1  1 |

**Question 6 (d)**

|  |  |
| --- | --- |
| Solution | |
| Marking key/mathematical behaviours | Marks |
| * uses and labels correct number of nodes * completes all edges * places correct weights on all edges | 1  1  1 |