**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
 | 11 |

**Question 1 (b)**

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

**Question 1 (c)**

|  |
| --- |
| SolutionT 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
 | 11 |

**Question 2 (a)**

|  |
| --- |
| SolutionThe 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
 | 11 |

**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]
 | 112 |

**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
 | 111 |

**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
 | 111 |

**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
 | 111 |

**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)
 | 111 |

**Question 4 (b)**

|  |
| --- |
| SolutionCannot travel every edge only once AND start and finish at same vertex |
| Marking key/mathematical behaviours | Marks |
| * describes first condition
* describes second condition
 | 11 |

© MAWA, 2016

This examination is Copyright but may be freely used within the school that purchases this licence.

* The items that are contained in this examination are to be used solely in the school for which they are purchased.
* They are not to be shared in any manner with a school which has not purchased their own licence.
* The items and the solutions/marking keys are to be kept confidentially and not copied or made available to anyone who is not a teacher at the school. Teachers may give feedback to students in the form of showing them how the work is marked but students are not to retain a copy of the paper or marking guide until the agreed release date stipulated in the purchasing agreement/licence.

*Published by The Mathematical Association of WA*

*12 Cobbler Place, MIRRABOOKA 6…*

**Question 4 (c)**

|  |
| --- |
| SolutionEuler’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
 | 11 |

**Question 4 (d)**

|  |
| --- |
| SolutionGraph is still connected when edge PQ is removed |
| Marking key/mathematical behaviours | Marks |
| * explains graph remains connected
* when edge PQ removed
 | 11 |

**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
 | 111 |

**Question 5 (b)**

|  |
| --- |
| Solution760 litres |
| Marking key/mathematical behaviours | Marks |
| * relates sequence to context of problem
 | 1 |

**Question 5 (c)**

|  |
| --- |
| Solution$T\_{n+1 = }T\_{n + }$200 $T\_{1}$= 360 |
| Marking key/mathematical behaviours | Marks |
| * describes recursive relation
* identifies starting term (or any particular term)
 | 11 |

**Question 5 (d)**

|  |
| --- |
| SolutionLinear. The increase is a constant number |
| Marking key/mathematical behaviours | Marks |
| * identifies correct relationship
* justifies choice of type
 | 11 |

**Question 5 (e)**

|  |
| --- |
| Solution 1960 |
| Marking key/mathematical behaviours | Marks |
| * identifies correct term (n = 9)
* determines correct value
 | 11 |

**Question 5 (f)**

|  |
| --- |
| Solution18 hours |
| Marking key/mathematical behaviours | Marks |
| * identifies correct term
 | 1 |

**Question 6 (a)**

|  |
| --- |
| Solution6 |
| Marking key/mathematical behaviours | Marks |
| * identifies Hamiltonian circuits
 | 1 |

**Question 6 (b)**

|  |
| --- |
| SolutionWXYZW or WZYXW 63 km |
| Marking key/mathematical behaviours | Marks |
| * identifies shortest circuit
* determines length of shortest circuit
 | 11 |

**Question 6 (c)**

|  |
| --- |
| SolutionIt goes through each vertex only onceIt starts and ends at the same vertex |
| Marking key/mathematical behaviours | Marks |
| * identifies cyclic nature
* describes path though vertices
 | 11 |

**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
 | 111 |