

GCE 2005

January Series



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark Scheme

Mathematics

MD01

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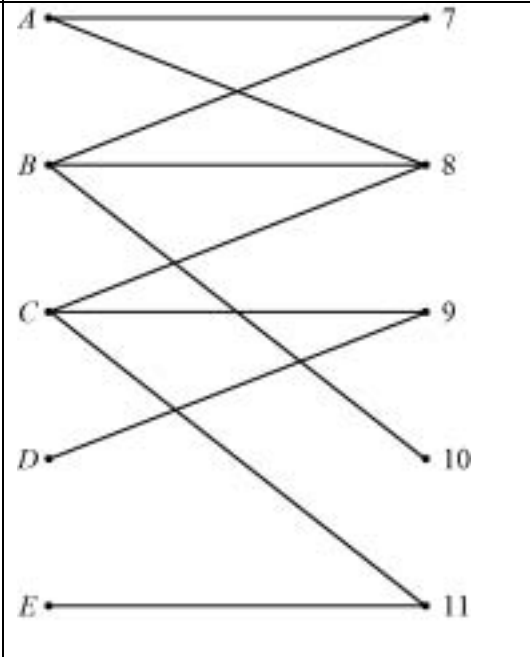
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Dr Michael Cresswell Director General

MD01

Q	Solution	Marks	Total	Comments																																																
1	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-bottom: 1px solid black; width: 10%;">A</td> <td style="border-bottom: 1px solid black; width: 10%;">B</td> <td style="border-bottom: 1px solid black; width: 10%;">C</td> <td style="border-bottom: 1px solid black; width: 10%;">D</td> <td style="border-bottom: 1px solid black; width: 10%;">E</td> <td style="border-bottom: 1px solid black; width: 10%;">F</td> </tr> <tr> <td>5</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>8</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>60</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>15</td> </tr> </table>	A	B	C	D	E	F	5	3							2							8							60							15	M1		SCA												
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Total			4																																																	
2(a)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td>19</td><td>3</td><td>7</td><td>20</td><td>2</td><td>6</td><td>5</td><td>15</td> </tr> <tr> <td>3</td><td>7</td><td>19</td><td>2</td><td>6</td><td>5</td><td>15</td><td>20</td> </tr> <tr> <td>3</td><td>7</td><td>2</td><td>6</td><td>5</td><td>15</td><td>19</td><td>20</td> </tr> <tr> <td>3</td><td>2</td><td>6</td><td>5</td><td>7</td><td>15</td><td>19</td><td>20</td> </tr> <tr> <td>2</td><td>3</td><td>5</td><td>6</td><td>7</td><td>15</td><td>19</td><td>20</td> </tr> <tr> <td>(2</td><td>3</td><td>5</td><td>6</td><td>7</td><td>15</td><td>19</td><td>20)</td> </tr> </table>	19	3	7	20	2	6	5	15	3	7	19	2	6	5	15	20	3	7	2	6	5	15	19	20	3	2	6	5	7	15	19	20	2	3	5	6	7	15	19	20	(2	3	5	6	7	15	19	20)	M1 A1 A1 A1		Bubble sort First pass for 19 First pass for 20 2 nd pass
	19	3	7	20	2	6	5	15																																												
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		A1	5	All correct																																																
(b)	7 comparisons 6 swaps	B1 B1	2																																																	
Total			7																																																	
3(a)	Odd vertices (<i>ADFI</i>)	E1	1																																																	
(b)	$AD + FI = 14 + 14 = 28$ $AF + DI = 14 + 13 = 27$ $AI + DF = 11 + 17 = 28$	M1 A2,1,0																																																		
	\therefore Repeat $AF + DI$ Distance = $87 + 27 = 114$ Route with $3A, 1B, 2C, 2D, 3E, 2F, 1G, 1H, 2I$	E1 B1 B1	6	may be implied 17 vertices																																																
Total			7																																																	

MD01 (cont)

Q	Solution	Marks	Total	Comments
<p>4(a)</p>  <p>(b) Initial $A8, B10, C9, E11$ Path $D \rightarrow 9 \rightarrow C \rightarrow 8 \rightarrow A \rightarrow 7$ Match $A7, B10, C8, D9, E11$</p>	<p>M1 A2</p> <p>M1 A1 A1 B1</p>	<p>3</p> <p>4</p>	<p>(-1 EE)</p> <p>starting from D7 $D \rightarrow 9 \rightarrow C$ or $7 \rightarrow A \rightarrow 8$</p>	
Total			7	

MD01 (cont)

Q	Solution	Marks	Total	Comments
5(a)	<i>AB</i> 3	M1		SCA Kruskal's (no method)
	<i>BC</i> 6			(a) B1
	<i>BE</i> 13	A1		<i>BE</i> third (b) B1
	<i>EF</i> 5			(c) M1 A2
	<i>FD</i> or 10			
	<i>FG</i> 32			
	<i>GJ</i> 7			
	<i>GH</i> 8	B1		10 edges
	<i>HK</i> 4			
	<i>HI</i> 12	A1	4	All correct
(b)	$\Sigma = 100$	B1	1	
(c)		M1		10 edges
		A2	3	(-1 EE)
(d)	Seventh <i>DF</i>	B1		
	Eighth <i>HI</i>	B1	2	
Total			10	

MD01 (cont)

Q	Solution	Marks	Total	Comments
6(a)		<p>M1</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>A1</p> <p>B1</p>	<p></p> <p></p> <p></p> <p></p> <p>6</p> <p>4</p> <p>10</p>	<p>SCA</p> <p>3 values at <i>C</i></p> <p>3 values at <i>E</i></p> <p>3 values at <i>H</i></p> <p>3 values at <i>J</i></p> <p>30 at <i>J</i> (dependent on first M1)</p>
	Total			

MD01 (cont)

Q	Solution	Marks	Total	Comments
7(a)(i)	$A \ B \ C \ D \ E \ F \ A$ $8 \ 10 \ 7 \ 15 \ 11 \ 7$ $= 58$	M1 A1	2	6 values
(ii)	$A \rightarrow C \rightarrow D \rightarrow F \rightarrow B \rightarrow E \rightarrow A$ $6 \ 7 \ 5 \ 8 \ 13 \ 12$ $= 51$	M1 M1 A1 B1	4	Tour starting and finishing at A Visits all vertices Correct order
(b)	Delete A	M1		SCA (MST plus 2 edges)
		M1		4 edges (not including A)
	Their MST + 6 (AC) + 7 (AF) Total = 44	M1 A1	5	
(c)	$45 \leq T \leq 51$	M1		Use of inequalities
	Max (45/their(b)) $\leq T \leq$ Min (their (a))	A1F A1F	3	45 51
Total			14	

MD01 (cont)

Q	Solution	Marks	Total	Comments
8(a)	$4x + 2y \leq 5 \times 4 \times 60$	B1	1	Condone =
(b)	$x \geq 40, y \geq 40$	B1		Both
	$x + y \geq 120$	B1		Both
	$x + y \leq 400$	B1		
	$(P =) 3x + y$	B1	3	
(c)		B1		$x \geq 40, y \geq 40$
		B1		$120 \leq x + y \leq 400$
		B1		$2x + y \leq 60$
		B1		Correct FR
		B1	5	Correct OL
(d)	Extreme points	M1		
	Max at $x = 280, y = 40$	A1		
	$P = 840 + 40 = \text{£}880$	B1	3	SC: (280, 20) scores 1/3
(e)(i)	Max at $(200, 200) \rightarrow (40, 360)$	M1		
	Profit $\text{£}800$	A1	2	
(ii)	No of combinations			
	$200 - 40 = 160$ $\quad + 1$ <hr style="width: 50px; margin-left: 0;"/> 161	B1		
		B1	2	
	Total		16	
	TOTAL		75	