

# GCE 2004

## *June Series*



# Mark Scheme

## Mathematics A

### *Unit MAD1*

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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*Dr Michael Cresswell Director General*

**Key to Mark Scheme**

<b>M</b> .....	mark is for .....	method
<b>m</b> .....	mark is dependent on one or more M marks and is for.....	method
<b>A</b> .....	mark is dependent on M or m marks and is for .....	accuracy
<b>B</b> .....	mark is independent of M or m marks and is for .....	method and accuracy
<b>E</b> .....	mark is for .....	explanation
✓ <b>or ft or F</b> .....	follow through from previous incorrect result	
<b>CAO</b> .....	correct answer only	
<b>AWFW</b> .....	anything which falls within	
<b>AWRT</b> .....	anything which rounds to	
<b>AG</b> .....	answer given	
<b>SC</b> .....	special case	
<b>OE</b> .....	or equivalent	
<b>A2,1</b> .....	2 or 1 (or 0) accuracy marks	
<b>-x EE</b> .....	deduct x marks for each error	
<b>NMS</b> .....	no method shown	
<b>PI</b> .....	possibly implied	
<b>SCA</b> .....	substantially correct approach	
<b>c</b> .....	candidate	
<b>SF</b> .....	significant figure(s)	
<b>DP</b> .....	decimal place(s)	

**Abbreviations used in Marking**

<b>MC – x</b> .....	deducted x marks for mis-copy
<b>MR – x</b> .....	deducted x marks for mis-read
<b>ISW</b> .....	ignored subsequent working
<b>BOD</b> .....	given benefit of doubt
<b>WR</b> .....	work replaced by candidate
<b>FB</b> .....	formulae booklet

**Application of Mark Scheme**

**No method shown:**

Correct answer without working.....	mark as in scheme
Incorrect answer without working .....	zero marks unless specified otherwise

**More than one method/choice of solution:**

2 or more complete attempts, neither/none crossed out	mark both/all fully and award the mean mark rounded down
1 complete and 1 partial attempt, neither crossed out	award credit for the complete solution only

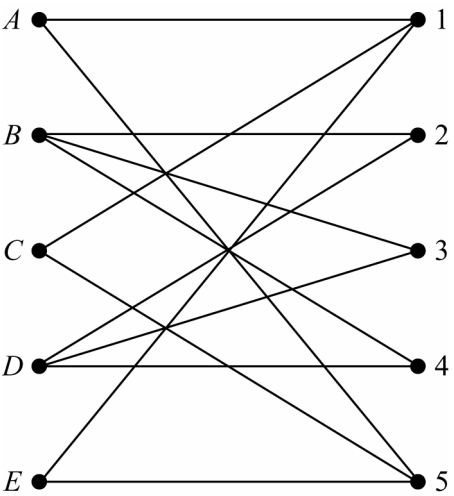
**Crossed out work**

do not mark unless it has not been replaced

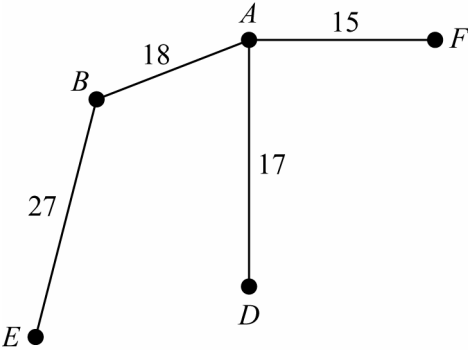
**Alternative solution** using a correct or partially correct method

award method and accuracy marks as appropriate

**MAD1**

Q	Solution	Marks	Total	Comments
1(a)		M1 A1	2	Bipartite graph All correct
(b)	A, C, E all need 1, 5	E1 E1	2	Or B & D Cannot do all of 2, 3, 4
<b>Total</b>			<b>4</b>	
2	17 26 5 14 6 33 28 25 - ~ • x - ~ • x  6 26 5 14 17 33 28 25 - - - -  5 14 6 25 17 26 28 33 - -  5 6 14 17 25 26 28 33	M1 A1  A1  M1 A1  A1		SCA Comparing 17 & 6  All correct  2 groups of 4 for 5 and 6  All correct
<b>Total</b>			<b>6</b>	

**MAD 1 (Cont)**

Q	Solution	Marks	Total	Comments
<b>3(a)(i)</b>	$C \rightarrow D \rightarrow A \rightarrow F \rightarrow B \rightarrow E \rightarrow C$ 13 17 15 18 27 22	M1 M1 A1 A1		Tour Visit every vertex $F$ after $A$ } dependant on starting from C All correct }
	= 112	B1	5	SC: 13+17+15+18+27+22=112 (4/5)
<b>(ii)</b>	A tour	E1		
	May be improved	E1	2	
<b>(b)</b>	MST	M1 A1		Spanning tree 4 edges (either $AB$ or $FB$ )
				
	77	A1		CAO
	LB = (their 77) + (13×2)	M1		(their 77) +13+14
	=103	A1	5	= 104 CAO
<b>(c)</b>	$103 \leq T \leq 112$	B1F	1	or $104 \leq T \leq 112$ their (b) $\leq T \leq$ their (a)(i)
<b>Total</b>			<b>13</b>	

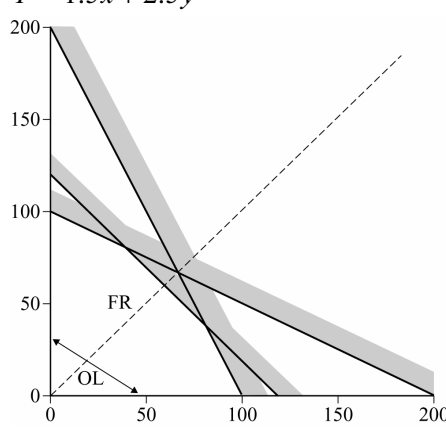
**MAD1 (Cont)**

Q	Solution	Marks	Total	Comments
<b>4(a)(i)</b>	BC – 6	M1	5	SCA } independent 9 edges } CE FH either order  Not DE } Must have M2 All correct }
	CD – 8	M1		
	CE – 9			
	FH – 9			
	GH – 10	A1		
	AC – 11	A1		
	GI – 12			
	DF – 14			
	AM – <u>30</u>			
	109	B1		
<b>(ii)</b>		M1	2	9 edges
		A1		
<b>(b)</b>	Odd vertices <i>AB, HI</i>		4	or their values shown (their total + their 39)  CAO SC: 248 with no working 2/4 SC: MR with <i>ABHIM</i> : M1 repeat <i>HB</i> A1 309
	Min connect <i>AB = 17</i> <i>HI = 22</i>	B1		
	Reject <i>AH, BI</i> and <i>AI, BH</i>	E1		
	Total $264 + 39$ $= 303$ metres	M1 A1		
<b>Total</b>			<b>11</b>	

**MAD1 (Cont)**

Q	Solution	Marks	Total	Comments
<p><b>5(a)</b></p>		<p>M1 A1 M1 M1 M1 M1 B1</p>	<p>7</p>	<p>SCA At <i>D</i> 2 values at <i>E</i> or <i>F</i> 3 values at <i>G</i> 2 values at <i>H</i> or <i>I</i> 3 values at <i>J</i> For 27</p>
<p><b>(b)</b></p>	<p>Route <i>ACDFGIJ</i></p>	<p>M1 A1</p>	<p>2</p>	<p>Or evidence of back tracking</p>
<p><b>(c)</b></p>	<p>24</p>	<p>B1</p>	<p>1</p>	
	<p><b>Total</b></p>		<p><b>10</b></p>	

**MAD1 (Cont)**

Q	Solution	Marks	Total	Comments
<b>6(a)</b>	$3x + 6y \leq 600$ $\Rightarrow x + 2y \leq 200$  $6x + 3y \leq 600$ $\Rightarrow 2x + y \leq 200$  $4x + 4y \leq 480$ $\Rightarrow x + y \leq 120$  $x \geq 0, y \geq 0$	B1 × 3	3	or roses  or carnations  or lilies OE  (condone absence)
<b>(b)</b>	$P = 1.5x + 2.5y$ 	B1  B1 × 3  B1  M1  A1	7	(maybe shown in part (c))  Lines  Region  Objective line with –ve gradient
<b>(c)</b>	Checking an extreme point $P = 260$	M1  A1	2	
<b>(d)</b>	$x > y$ Max at (60, 60) But $x > y$ $\therefore x = 61, y = 59$ $P = 239$	M1  M1   A1  A1	4	or $y = x$ on diagram  Attempt at points around (60, 60)
	<b>Total</b>		<b>16</b>	
	<b>Total</b>		<b>60</b>	