GCE 2005

January Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Mathematics

MD01

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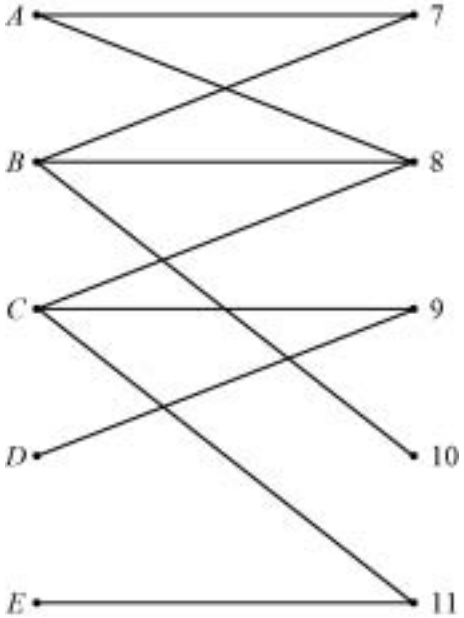
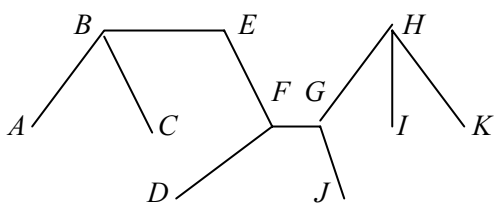
MD01

Q	Solution	Marks	Total	Comments
1				
	A B C D E F 5 3 2 8 60 15	M1 A1 A1 A1F	 4	SCA For 2 or 8 For 60 For 15
	Total		**4**	
2(a)				
	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 A1	 5	Bubble sort First pass for 19 First pass for 20 2nd pass All correct
(b)	7 comparisons 6 swaps	B1 B1	 2	
	Total		**7**	
3(a)	Odd vertices (*ADFI*)	E1	1	
(b)	$AD + FI = 14 + 14 = 28$ $AF + DI = 14 + 13 = 27$ $AI + DF = 11 + 17 = 28$ $\therefore$ Repeat $AF + DI$ Distance = 87 + 27 = 114 Route with $3A, 1B, 2C, 2D, 3E, 2F, 1G, 1H, 2I$	M1 A2,1,0 E1 B1 B1	 6	 may be implied 17 vertices
	Total		**7**	

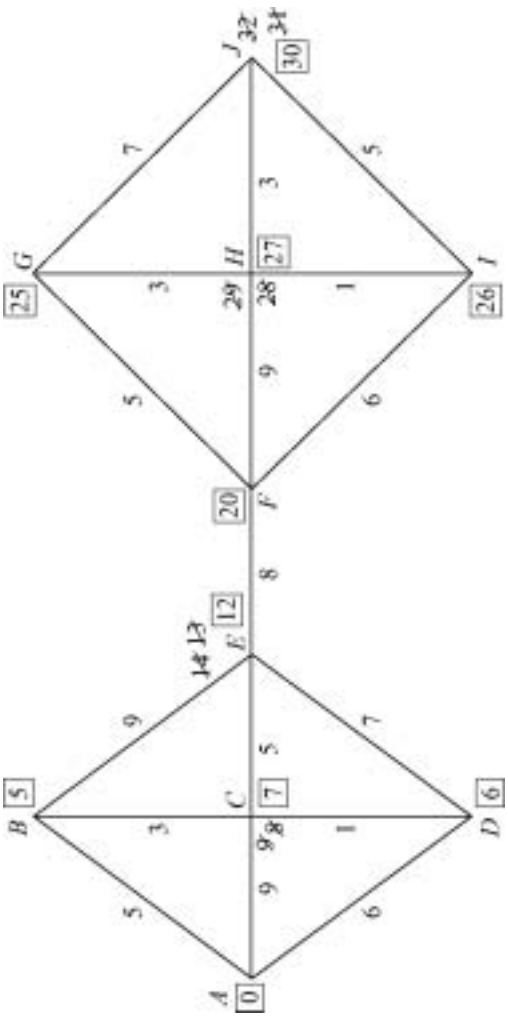
MD01 (cont)

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

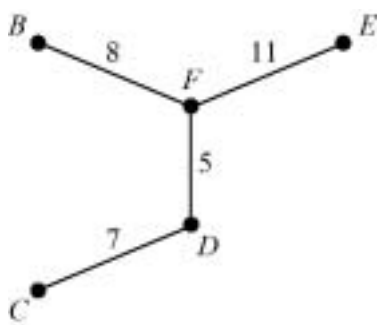
MD01 (cont)

Q	Solution	Marks	Total	Comments
5(a)	*AB* 3 *BC* 6 *BE* 13 *EF* 5 *FD* or 10 *FG* 32 *GJ* 7 *GH* 8 *HK* 4 *HI* 12	M1 A1 B1 A1	 4	SCA *BE* third 10 edges All correct
(b)	$\Sigma = 100$	B1	1	
(c)		M1 A2	 3	10 edges (–1 EE)
(d)	Seventh *DF* Eighth *HI*	B1 B1	 2	
	Total		**10**	

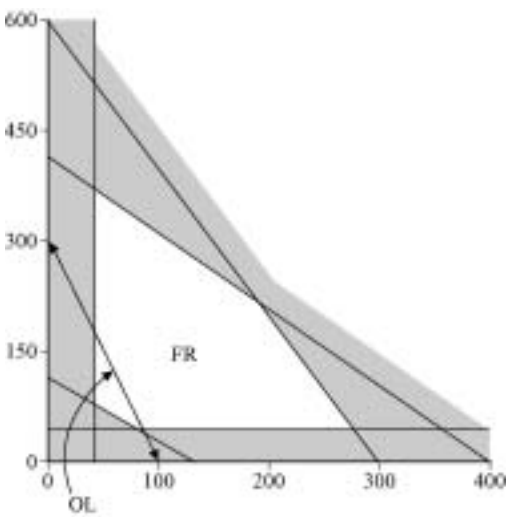
MD01 (cont)

Q	Solution	Marks	Total	Comments
6(a)		M1		SCA
		M1		3 values at C
		M1		3 values at E
		M1		3 values at H
		M1		3 values at J
		A1	6	30 at J (dependent on first M1)
(b)	Use of $x+5$ or $x+11$	M1		
	(AG) $5+x<25$ or $x<20$	A1		
	(AJ) $11+x\geq 30$ or $x\geq 19$	A1		
	$x=19$	B1	4	
	Total		**10**	

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 A1		4 edges (not including *A*)
	Their MST + 6 (*AC*) + 7 (*AF*) Total = 44	M1 A1	5	
(c)	$45 \leq T \leq 51$	M1 A1F		Use of inequalities 45
	Max (45/their(b)) $\leq T \leq$ Min (their (a))	A1F	3	51
	Total		**14**	

MD01 (cont)

Q	Solution	Marks	Total	Comments
8(a)	$4x + 2y \le 5 \times 4 \times 60$	B1	1	Condone =
(b)	$x \ge 40, \quad y \ge 40$	B1		Both
	$x + y \ge 120$			
	$x + y \le 400$	B1		Both
	$(P =)\ 3x + y$	B1	3	
(c)				
		B1		$x \ge 40,\ y \ge 40$
		B1		$120 \le x + y \le 400$
		B1		$2x + y \le 60$
		B1		Correct FR
		B1	5	Correct OL
(d)	Extreme points	M1		
	Max at $x = 280,\ y = 40$	A1		
	P = 840 + 40 = £880	B1	3	SC: (280, 20) scores 1/3
(e)(i)	Max at $(200, 200) \rightarrow (40, 360)$	M1		
	Profit £800	A1	2	
(ii)	No of combinations			
	$200 - 40 = 160$	B1		
	$+\ 1$			
	161	B1	2	
	Total		**16**	
	TOTAL		**75**	