

Mark Scheme (Results) Summer 2008

GCE

GCE Mathematics (6689/01)

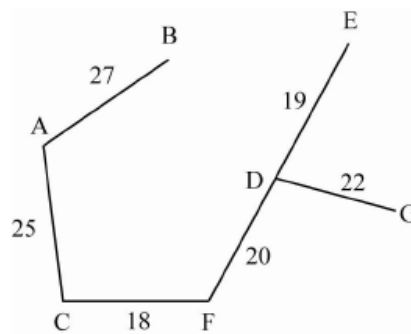
June 2008
6689 Decision Mathematics D1
Mark Scheme

Question Number	Scheme	Marks
Q1		
(a)	$\frac{502}{100} = 5.02$ so 6 tapes.	M1 A1 (2)
(b)	Bin 1: 29, 52 Bin 5: 47, 38 Bin 2: 73 Bin 6: 61 Bin 3: 87 Bin 7: 41 Bin 4: 74	M1 A1 A1 (3)
(c)	Bin 1: 87 Bin 4: 61, 38 Bin 2: 74 Bin 5: 52, 47 Bin 3: 73 Bin 6: 41, 29	M1 A1 A1 (3)
	Notes: (a) 1M1: $(502 \pm 40) \div 100$ (maybe implicit) 1A1: cao 6 tapes (b) 1M1: Bin 1 correct and at least 8 values put in bins 1A1: Condone one error, (e.g. extra, omission, 'balanced'swap'). 2A1: All correct (c) 1M1: Bin 1 correct and at least 8 values put in bins 1A1: Condone one error, (e.g. extra, omission, 'balanced'swap'). 2A1: All correct	Total 8

Question Number	Scheme	Marks
Q2	<p>(a) $G - 5 = W - 3$ change status $G = 5 - W = 3$</p> <p>(b) A – no match $E = 2$ $G = 5$ $R = 4$ $W = 3$</p> <p>(c) e.g. R is the only person who can do 1 and the only person who can do 4</p> <p>(d) $A - 2 = E - 3 = W - 4 = R - 1$ change status $A = 2 - E = 3 - W = 4 - R = 1$ $A = 2$ $E = 3$ $G = 5$ $R = 1$ $W = 4$</p> <p>Notes: (a) 1M1: Path from G to 3 1A1: CAO including change status (stated or shown), chosen path clear. (b) 2A1: CAO must fit from stated path (c) 1B1: Correct answer, may be imprecise or muddled (bod gets B1) but all nodes referred to must be correct. 2B1: Good, clear, correct answer. (d) 1M1: Path from A to 1 1A1: CAO including change status (stated or shown) but don't penalise twice. Chosen path clear. 1A1: CAO must fit from stated path</p> <p>Misread (remove last two A or B marks if earned.) $A - 2 = E - 3$ c.s. $A=2 - E = 3$ Matching $A = 2, E = 3, R = 4 W = 5$ Then $G - 5 = W - 4 = R - 1$ c.s. $G = 5 - W = 4 - R = 1$ Matching $A = 2, E = 3, G = 5, R = 1, W = 4$</p>	<p>M1 A1 (2)</p> <p>A1 (1)</p> <p>B 2, 1, 0 (2)</p> <p>M1 A1</p> <p>A1 (3)</p> <p>Total 8</p>

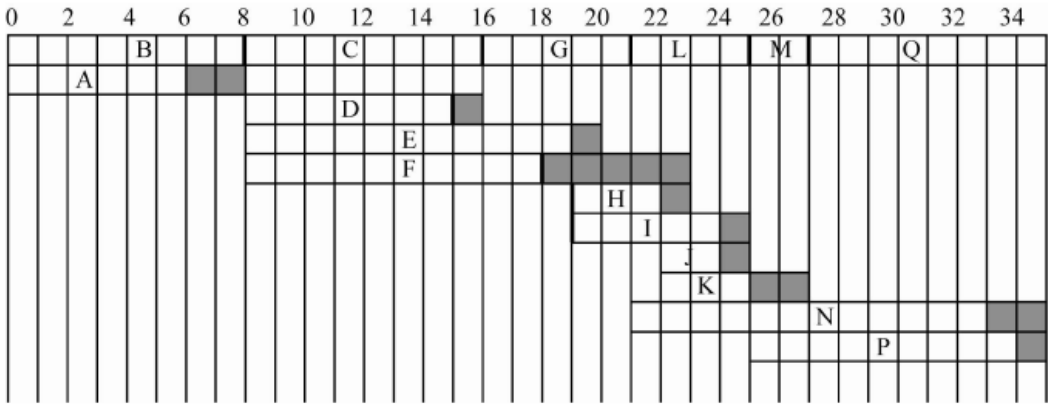
Question Number	Scheme	Marks
<p>Q3</p> <p>(a)</p>	<p>Route: ADGHI Length: 48 (km)</p> <p>(b) Odd vertices are A and H Attempt to find shortest route from A to H = ADGH New length: $197 + 36 = 233$ Route: e.g. ADGHGDACEDHIFHEFBA (18)</p> <p>Notes:</p> <p>(a) 1M1: Smaller number replacing larger number in the working values at E or F or H or I. (generous – give bod) 1A1: All values in boxes A to E and G correct 2A1ft: All values in boxes F, H and I correct (ft). Penalise order of labelling just once. 3A1: CAO (not ft) 4A1ft: Follow through from their I value, condone lack of units here.</p> <p>(b) 1B1: A and H identified in some way – allow recovery from M mark. 1M1: Accept, if correct, path, or its length. Accept attempt if finding shortest. 1A1ft: $197 +$ their shortest A to H (36) 2A1: A correct route.</p>	<p>M1</p> <p>A1</p> <p>A1ft</p> <p>A1</p> <p>A1ft</p> <p>(5)</p> <p>B1</p> <p>M1</p> <p>A1ft</p> <p>A1 (4)</p> <p>Total 9</p>

Question Number	Scheme	Marks
Q4	<p>(a) e.g.</p> <ul style="list-style-type: none"> • Prim's starts with any vertex, Kruskal starts with the shortest arc. • It is not necessary to check for cycles when using Prim. • Prim's adds nodes to the growing tree, Kruskal adds arcs. • The tree 'grows' in a connected fashion when using Prim. • Prim can be used when data in a matrix form. <p>Other correct statements also get credit.</p> <p>(b)(i) e.g. AC, CF, FD, DE, DG, AB.</p> <p>(ii) CF, DE, DF, not CD, not EF, DG, not FG, not EG, AC, not AD, AB. [18, 19, 20, not 21, not 21, 22, not 23, not 24, 25, not 26, 27]</p> <p>Notes:</p> <p>(a) 1B1: Generous one correct difference. If bod give B1 2B1: Generous two distinct, correct differences.</p> <p>(b) 1M1: Prim's algorithm – first three arcs chosen correctly, in order, or first four nodes chosen correctly, in order. 1A1: First five arcs chosen correctly; all 7 nodes chosen correctly, in order. 2A1: All correct and arcs chosen in correct order. 2M1: Kruskal's algorithm – first 4 arcs selected chosen correctly. 1A1: All six non-rejected arcs chosen correctly. 2A1: All rejections correct and in correct order and at correct time.</p> <div style="text-align: center;"> </div>	<p>B 2, 1, 0 (2)</p> <p>M1, A1, A1 (3)</p> <p>M1, A1, A1 (3)</p> <p>Total 8</p>



Question Number	Scheme	Marks
Q5	<p>(a) $x = 9, y = 11$</p> <p>(b) AC DC DT ET</p> <p>(c) 36</p> <p>(d) $C_1 = 49, C_2 = 48, C_3 = 39$</p> <p>(e) e.g. SAECT</p> <p>(f) maximum flow = minimum cut cut through DT, DC, AC and AE</p> <p>Notes:</p> <p>(a) 1B1: cao (permit B1 if 2 correct answers, but transposed) 2B1: cao</p> <p>(b) 1B1: correct (condone one error – omission or extra) 2B1: all correct (no omissions or extras)</p> <p>(c) 1B1: cao</p> <p>(d) 1B1: cao 2B1: cao 3B1: cao</p> <p>(e) 1B1: A correct route (flow value of 1 given)</p> <p>(f) 1M1: Must have attempted (e) and made an attempt at a cut. 1A1: cut correct – may be drawn. Refer to max flow-min cut theorem three words out of four.</p>	<p>B1,B1 (2)</p> <p>B2,1,0 (2)</p> <p>B1 (1)</p> <p>B1,B1,B1 (3)</p> <p>B1 (1)</p> <p>M1 A1 (2)</p> <p>Total 11</p>

Question Number	Scheme								Marks		
Q6	(a)	b.v	x	y	z	R	s	t	value		
		r	4	$\frac{7}{3}$	$\frac{5}{2}$	1	0	0	64		
		s	1	3	0	0	1	0	16		
		t	4	2	2	0	0	1	60		
		P	-5	$-\frac{7}{2}$	-4	0	0	0	0		
			b.v	x	y	z	R	s	t	value	Row ops
			r	0	$\frac{1}{3}$	$\frac{1}{2}$	1	0	-1	4	$R_1 - 4R_3$
			s	0	$\frac{5}{2}$	$-\frac{1}{2}$	0	1	$-\frac{1}{4}$	1	$R_2 - R_3$
			x	1	$\frac{1}{2}$	$\frac{1}{2}$	0	0	$\frac{1}{4}$	15	$R_3 \div 4$
			P	0	-1	$-\frac{3}{2}$	0	0	$\frac{5}{4}$	75	$R_4 + 5R_3$
			b.v	x	y	z	R	s	t	value	Row ops
			z	0	$\frac{2}{3}$	1	2	0	-2	8	$R_1 \div \frac{1}{2}$
			s	0	$\frac{17}{6}$	0	1	1	$-\frac{5}{4}$	5	$R_2 + \frac{1}{2}R_1$
			x	1	$\frac{1}{6}$	0	-1	0	$\frac{5}{4}$	11	$R_3 - \frac{1}{2}R_1$
			P	0	0	0	3	0	$-\frac{7}{4}$	87	$R_4 + \frac{3}{2}R_1$
	(b)	There is still a negative number in the profit row.								B1 (1)	
Total 10											

Question Number	Scheme	Marks
Q7	<p>(a) $v = 16$ $w = 25$ $x = 23$ $y = 20$ $z = 8$</p> <p>(b) B C G L M Q</p> <p>(c) Float on H = $23 - 19 - 3 = 1$ Float on J = $25 - 22 - 2 = 1$</p> <p>(d)</p>  <p>(e) E has one day of float, so project can still be completed on time.</p> <p>(f) e.g.</p> <ul style="list-style-type: none"> At time $23 \frac{1}{2}$ activities L, I, J and N must be taking place At time $13 \frac{1}{2}$ or $14 \frac{1}{2}$ activities C, D, E and F must be taking place <p>So 4 workers needed.</p>	<p>B3,2,1,0 (3)</p> <p>B1 (1)</p> <p>B1 B1 (2)</p> <p>M1 A1 A1 A1 (4)</p> <p>B2,1,0 (2)</p> <p>B2,1,0 (2)</p> <p>Total 14</p>

Question Number	Scheme	Marks
Q8	<p>Maximise (P=) $0.2 a + 0.15 b$ or $20 a + 15 b$ o.e.</p> <p>Subject to</p> $a + b \leq 800$ $a \geq 2b$ $50 \leq b \leq 100$ $a \geq 0$ <p>Notes: 1B1: 'Maximise' 2B1: ratio of coefficients correct 3B1: cao 4B1: ratio of coefficients of a and b correct. 5B1: inequality correct way round i.e. $\square a \geq \square b$ 6B1: cao accept $<$ – accept two separate inequalities here 7B1: cao</p> <ul style="list-style-type: none"> • Penalise $<$ and $>$ only once with last B mark earned • Be generous on letters a, b, A, B, x, y etc and mixed, but remove last B mark earned if inconsistent or 3 letters in the ones marked. 	<p>B1 B1 (2)</p> <p>B1 B2,1,0 B1 B1 (5)</p> <p>Total 7</p>