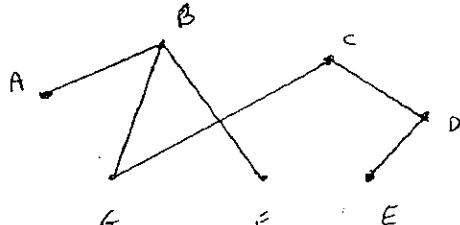
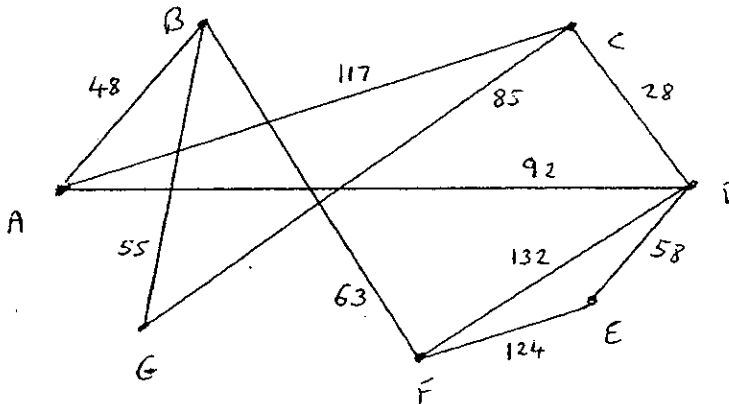


January 2006
6689 Decision D1
Mark Scheme

Question Number	Scheme	Marks
1) (a)	<p>There are 2 unmatched vertices on each side - the algorithm only matches one on each side per iteration.</p> <p>(b) e.g. $E-3=C-1$ c.s. $E=3-C=1$ $F-5=A-6=D-2=B-4$ c.s. $F=5-A=6-D=2=B-4$ $A=6$ $B=4$ $C=1$ $D=2$ $E=3$ $F=5$</p>	<p>B1 (1)</p> <p>(M) A1 (2)</p> <p>(M) A1 (2)</p> <p>(M) A1 (2)</p> <p>[7]</p>
2) (a)	<p>AB, BG, BF, GC, CD, DE {1 2 5 6 7 4 3}</p> <p>weight 337m</p>  <p>(b)</p>  <p>(c)</p> <p>$AB + CF = 48 + 160 = 208$ $AC + BF = 117 + 63 = 180 *$ $AF + BC = 111 + 140 = 251$</p> <p>e.g. $\overline{ABFBGCACDEFDA}$ length $802 + 180 = 982m$</p>	<p>M1 A1 A1 (3)</p> <p>B1</p> <p>B1 ✓ (2)</p> <p>M1</p> <p>A1</p> <p>A1 (3)</p> <p>M1 A1</p> <p>A1</p> <p>A1 (4)</p> <p>A1</p> <p>M1 A1 ✓ (3)</p> <p>[15]</p>

3)

A	B	n	C	D	E
1.618	-0.618	1	1.618	-0.618	1
		2	2.618	0.382	1
		3	4.236	-0.236	2
		4	6.854	0.146	3
		5	11.089	-0.090	5

Output : 1, 1, 2, 3, 5

M1
A1 A1 (3)
M1 A1 ✓
A1 ✓
A1
A1 (5)
A1 ✓ (1)
9

4) a)

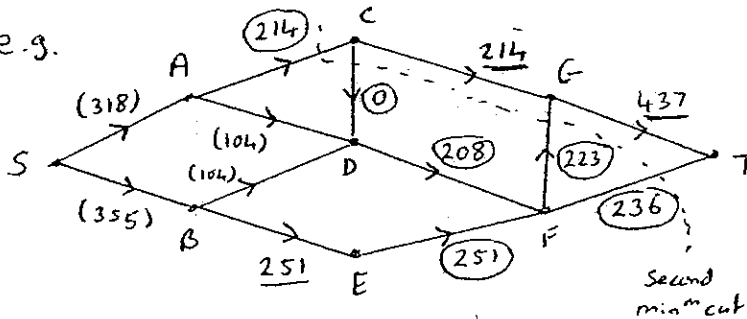
(i) A cut is a division of the vertices of a flow network into 2 sets, one containing the source (s) and the other containing the sink (t).

(ii) A cut whose capacity is least

B1
B1 (2)
B1, B2, 0
(3)

(b) $C_1 = 1038$, $C_2 = 673$

(c) e.g.



○ = saturated
- - = compulsory

M1
A1
A1 (3)

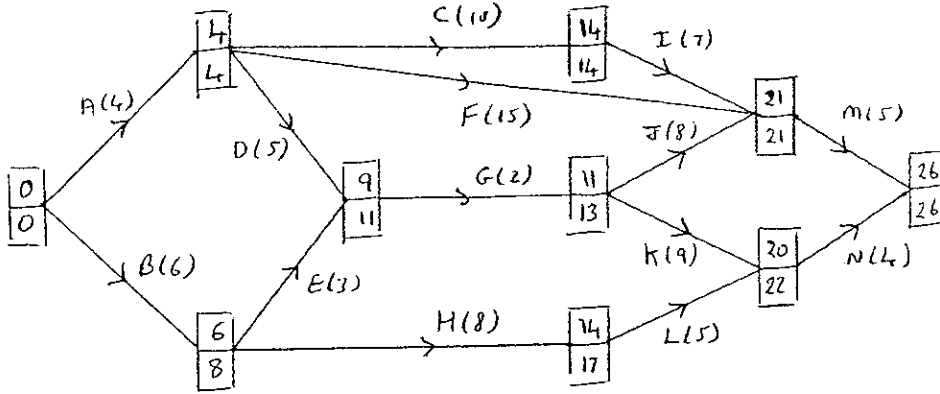
(d) AC, CD, GF, FT

(e) DE would not allow any further flow into EF

DG would cross both minimum cuts - D contains extra flow, G T can accept it. Flow increases by 86 to 759 (accept either number)

B1 (1)
B2, 1, 0
(2)
11

5 (a)



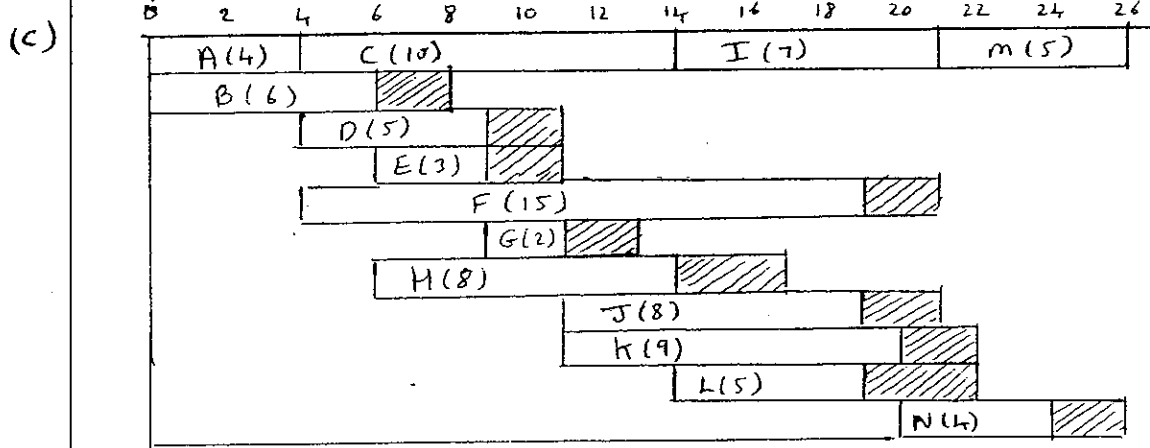
M 1 A 1

M 1 A 1

(4)

(b) A C I m length 26

B 1 B 1 V (2)



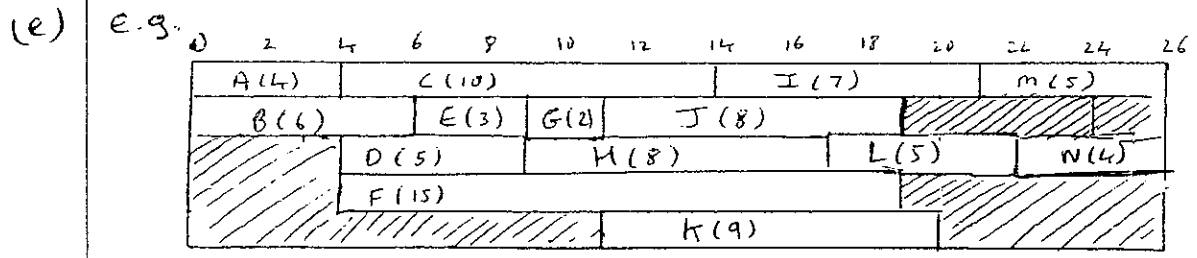
M 1

A 3, 2 / 10

(4)

(d) 5 workers needed eg ref to 13-14 when C, F, H, J and K must be taking place
eg ref to 18-19 when I F J K L must be taking place

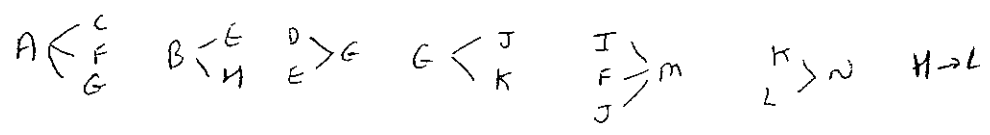
B 2, 1, 0
(2)



M 1

A 2, 1, 0

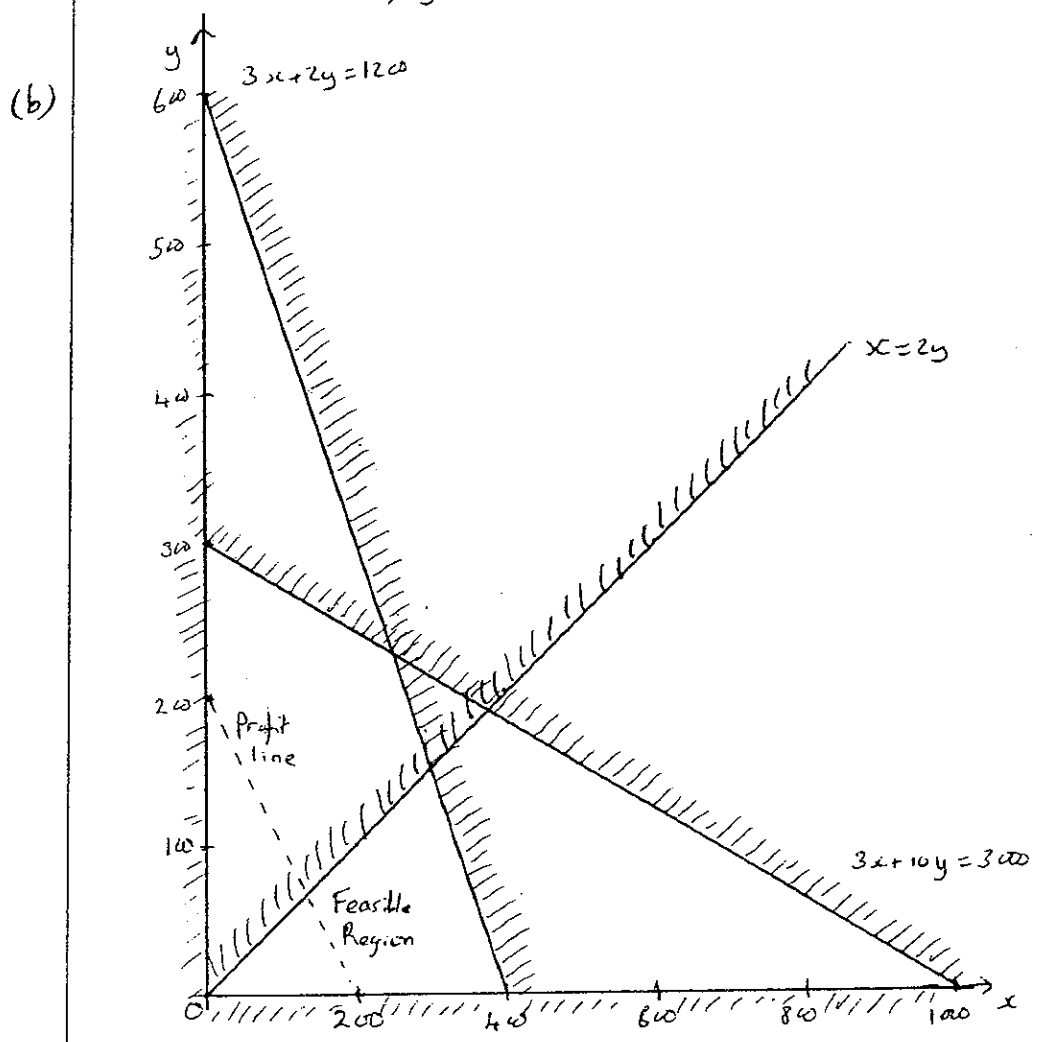
(3)



15

6. a) Maximise, $(P=) 15x + 15y$
 Subject to $3x + 10y \leq 3000$
 $3x + 2y \leq 1200$
 $x \geq 2y$
 $x, y \geq 0$

B1,
 B3, 2, 1, 0
 (5)



B6, 5, 4, 3, 2, 1, 0
 (6)

- (c) Profit line or vertex testings, $(300, 150)$, profit = £ 67.50
- (d) Production of stickers should be increased since this would move the intersection point further from the origin.
- (e) e.g. The constraint lines would be far outside the feasible region - so they would not affect it.

M1 A1/A1 (3)
 B2, 1, 0 (2)
 B2, 1, 0 (2)