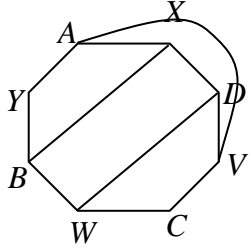
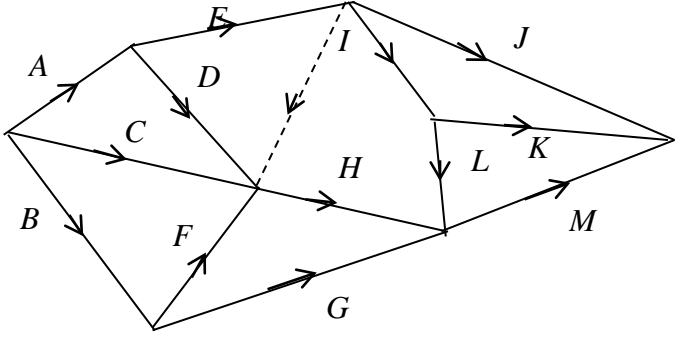
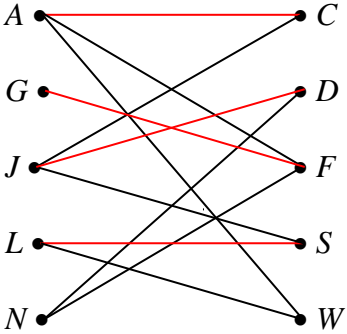
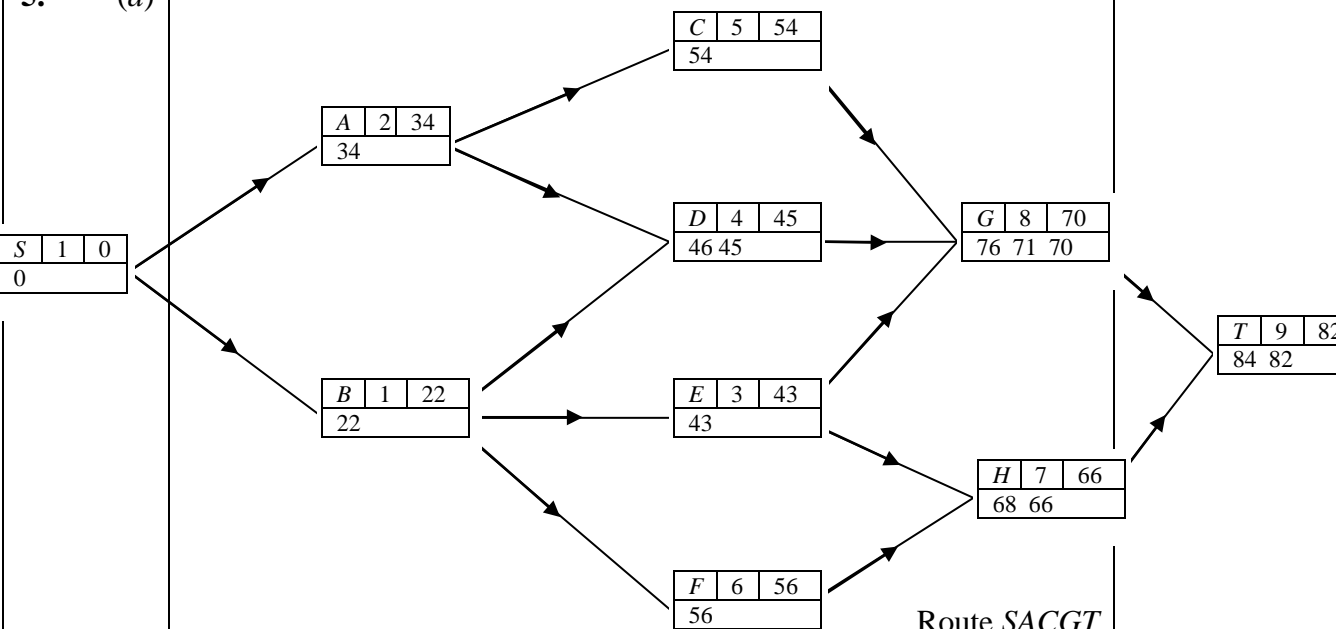
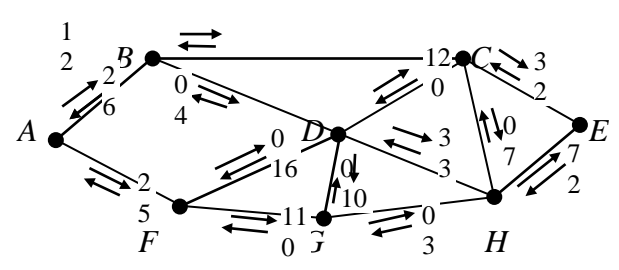
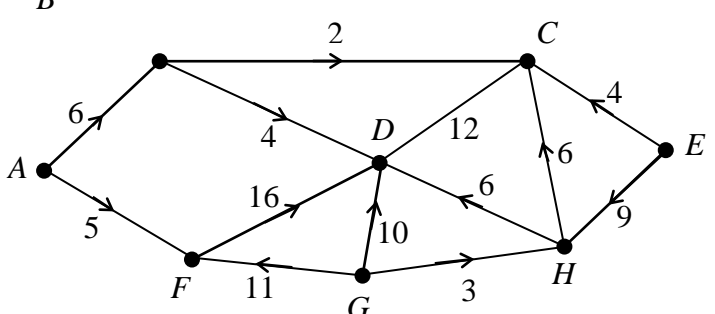


EDEXCEL DECISION MATHEMATICS D1 (6689) - NOVEMBER 2002 PROVISIONAL MARK SCHEME

Question Number	Scheme	Marks
<p>1. (a)</p> <p>(b)</p>	<p>(A, X, D, V), C, W, B, Y, A</p> 	<p>M1, A1 (2)</p> <p>M1 A1 (2)</p> <p>(4 marks)</p>
<p>2. (a)</p> <p>(b)</p>	 <p><i>H, I and J all depend on E, but I and J depend only on E whereas H depends on E and C and D and F</i></p>	<p>M1 A1 (A → F) A1 (dummy) A1 (G → M) A1 (1 start + 1 finish)</p> <p>(5)</p> <p>B1 (1)</p> <p>(6 marks)</p>

Question Number	Scheme	Marks
<p>3. (a)</p>  <p>(b)</p> $C = A - W$ $D = J$ $S = L - W$ N $F = G \text{ (stop)}$ <p>So either $N = D - J = C - A = W$ Or $N = D - J = S - L = W$</p> <p>Matchings $A - W, G - F, J - C, L - S$ and $N - D$ Or $A - C, G - F, J - S, L - W$ and $N - D$</p> <p>(c) If J does D, N must do F, leaving G without a sport to coach.</p>	<p>B1, B1 (2)</p> <p>M1 A1</p> <p>A1 (3)</p> <p>B2, 1, 0 (2)</p> <p>(7 marks)</p>	<p>(2)</p> <p>(3)</p> <p>(2)</p> <p>(7 marks)</p>
<p>4. (a)</p> <p>Odd nodes C, F, G, H</p> $CF + GM = 12 + 8 = 20$ $CG + FM = 9 + 7 = 16$ $CM + FG = 9 + 10 = 19$ <p>So CG and FH should be repeated</p> <p>(b) FH is the shortest path so finish at G</p> <p>Length of route = $137 + 7 = 144$</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>A1 (4)</p> <p>B2, 1, 0</p> <p>B1 (3)</p> <p>(7 marks)</p>	<p>B1</p> <p>(4)</p> <p>(3)</p> <p>(7 marks)</p>

Question Number	Scheme	Marks														
<p>5. (a)</p>  <p>Route <i>SACGT</i> length 82</p>	<p>(b) E.g. $82 - 12 = 70$ <i>GT</i> $70 - 16 = 54$ <i>CG</i> $54 - 20 = 34$ <i>AC</i> $34 - 34 = 0$ <i>SA</i></p> <p>Work back from <i>T</i>. Include arc <i>XY</i> if <i>Y</i> already lies on the path and arc length $XY = \text{Final label of } Y - \text{final label of } X$</p>	<p>A1 ft (6)</p> <p>B2, 1,0 (2)</p> <p>M1</p> <p>A1 (2)</p>														
<p>6. (a)</p>	<table border="0"> <tr> <td style="text-align: center;">Left to right</td> <td style="text-align: center;">Right to left</td> </tr> <tr> <td>55 80 25 84 25 34 17 75 3 5</td> <td>55 80 25 84 25 34 17 75 3 5</td> </tr> <tr> <td>80 55 84 25 34 25 75 17 5 3</td> <td>84 55 80 25 75 25 34 17 5 3</td> </tr> <tr> <td>80 84 55 34 25 75 25 17 5 3</td> <td>84 8 55 75 25 34 25 17 5 3</td> </tr> <tr> <td>84 80 55 34 75 25 25 17 5 3</td> <td>84 80 75 55 34 25 25 17 5 3</td> </tr> <tr> <td>84 80 55 75 34 25 25 17 5 3</td> <td></td> </tr> <tr> <td>84 80 75 55 34 25 25 17 5 3</td> <td></td> </tr> </table> <p>Sort complete, no more changes</p>	Left to right	Right to left	55 80 25 84 25 34 17 75 3 5	55 80 25 84 25 34 17 75 3 5	80 55 84 25 34 25 75 17 5 3	84 55 80 25 75 25 34 17 5 3	80 84 55 34 25 75 25 17 5 3	84 8 55 75 25 34 25 17 5 3	84 80 55 34 75 25 25 17 5 3	84 80 75 55 34 25 25 17 5 3	84 80 55 75 34 25 25 17 5 3		84 80 75 55 34 25 25 17 5 3		<p>M1</p> <p>A1</p> <p>A1</p> <p>A1</p> <p>A1</p> <p>A1 (5)</p> <p>M1 A1 (2)</p> <p>Bin 1 84 5</p> <p>Bin 2 80 17 3</p> <p>Bin 3 75 25</p> <p>Bin 4 55 34</p> <p>Bin 5 25</p> <p>M1 (to 34)</p> <p>A1 (to 2nd 25)</p> <p>A1 (3)</p> <p>(10 marks)</p>
Left to right	Right to left															
55 80 25 84 25 34 17 75 3 5	55 80 25 84 25 34 17 75 3 5															
80 55 84 25 34 25 75 17 5 3	84 55 80 25 75 25 34 17 5 3															
80 84 55 34 25 75 25 17 5 3	84 8 55 75 25 34 25 17 5 3															
84 80 55 34 75 25 25 17 5 3	84 80 75 55 34 25 25 17 5 3															
84 80 55 75 34 25 25 17 5 3																
84 80 75 55 34 25 25 17 5 3																

Question Number	Scheme	Marks
<p>7. (a) <i>A, E and G</i> (b) 45 (c)</p>	 <p>e.g. <i>EHD - 2</i> <i>ECHD - 1</i></p>	<p>B2, 1, 0 B1 (3) M1 A1 M1 A1 M1 A1 (6)</p>
<p>(d) (e)</p>	 <p>Maximum Flow 48 Cut through <i>DB, DC, DH, DG, DF</i></p>	<p>M1 A1 B1 (3) M1 A1 (2) (14 marks)</p>

Question Number	Scheme	Marks																																									
8.	(a) Objective: Maximise $P = 4x + 5y = 3z$ Subject to $3x + 2y + 4z \leq 35$ $x + 3y + 2z \leq 20$ $4x + 5y + 3z \leq 24$	B1 B1 B1 B1 (4)																																									
	(b)																																										
	<table border="1"> <thead> <tr> <th>Basic Variable</th> <th>x</th> <th>y</th> <th>z</th> <th>r</th> <th>s</th> <th>t</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>r</td> <td>2</td> <td>0</td> <td>$\frac{5}{4}$</td> <td>1</td> <td>0</td> <td>$-\frac{1}{2}$</td> <td>23</td> </tr> <tr> <td>s</td> <td>$-\frac{1}{2}$</td> <td>0</td> <td>$-\frac{1}{4}$</td> <td>0</td> <td>1</td> <td>$-\frac{3}{4}$</td> <td>2</td> </tr> <tr> <td>y</td> <td>$\frac{1}{2}$</td> <td>1</td> <td>$\frac{3}{4}$</td> <td>0</td> <td>0</td> <td>$\frac{1}{4}$</td> <td>6</td> </tr> <tr> <td>P</td> <td>$-\frac{3}{2}$</td> <td>0</td> <td>$\frac{3}{4}$</td> <td>0</td> <td>0</td> <td>$\frac{5}{4}$</td> <td>30</td> </tr> </tbody> </table>	Basic Variable	x	y	z	r	s	t	Value	r	2	0	$\frac{5}{4}$	1	0	$-\frac{1}{2}$	23	s	$-\frac{1}{2}$	0	$-\frac{1}{4}$	0	1	$-\frac{3}{4}$	2	y	$\frac{1}{2}$	1	$\frac{3}{4}$	0	0	$\frac{1}{4}$	6	P	$-\frac{3}{2}$	0	$\frac{3}{4}$	0	0	$\frac{5}{4}$	30	$R_1 - 2R_2$ $R_2 - 3R_3$ $R_3 \div 4$ $R_4 + 5R_3$	M1 A1 M1 A1 (4)
	Basic Variable	x	y	z	r	s	t	Value																																			
	r	2	0	$\frac{5}{4}$	1	0	$-\frac{1}{2}$	23																																			
	s	$-\frac{1}{2}$	0	$-\frac{1}{4}$	0	1	$-\frac{3}{4}$	2																																			
	y	$\frac{1}{2}$	1	$\frac{3}{4}$	0	0	$\frac{1}{4}$	6																																			
	P	$-\frac{3}{2}$	0	$\frac{3}{4}$	0	0	$\frac{5}{4}$	30																																			
	<table border="1"> <thead> <tr> <th>Basic Variable</th> <th>x</th> <th>y</th> <th>z</th> <th>r</th> <th>s</th> <th>t</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>x</td> <td>1</td> <td>0</td> <td>$\frac{5}{4}$</td> <td>$\frac{1}{2}$</td> <td>0</td> <td>$-\frac{1}{4}$</td> <td>$\frac{23}{2}$</td> </tr> <tr> <td>s</td> <td>0</td> <td>0</td> <td>$\frac{3}{8}$</td> <td>$\frac{1}{4}$</td> <td>1</td> <td>$-\frac{7}{8}$</td> <td>$\frac{31}{4}$</td> </tr> <tr> <td>y</td> <td>0</td> <td>1</td> <td>$\frac{1}{8}$</td> <td>$-\frac{1}{4}$</td> <td>0</td> <td>$\frac{3}{8}$</td> <td>$\frac{1}{4}$</td> </tr> <tr> <td>P</td> <td>0</td> <td>0</td> <td>$\frac{21}{8}$</td> <td>$\frac{21}{8}$</td> <td>0</td> <td>$\frac{7}{8}$</td> <td>$\frac{189}{4}$</td> </tr> </tbody> </table>	Basic Variable	x	y	z	r	s	t	Value	x	1	0	$\frac{5}{4}$	$\frac{1}{2}$	0	$-\frac{1}{4}$	$\frac{23}{2}$	s	0	0	$\frac{3}{8}$	$\frac{1}{4}$	1	$-\frac{7}{8}$	$\frac{31}{4}$	y	0	1	$\frac{1}{8}$	$-\frac{1}{4}$	0	$\frac{3}{8}$	$\frac{1}{4}$	P	0	0	$\frac{21}{8}$	$\frac{21}{8}$	0	$\frac{7}{8}$	$\frac{189}{4}$	$R_1 \div 2$ $R_2 + \frac{1}{2}R_1$ $R_3 - \frac{1}{2}R_1$ $R_4 + \frac{3}{2}R_1$	M1 A1 M1 A1 (4)
	Basic Variable	x	y	z	r	s	t	Value																																			
x	1	0	$\frac{5}{4}$	$\frac{1}{2}$	0	$-\frac{1}{4}$	$\frac{23}{2}$																																				
s	0	0	$\frac{3}{8}$	$\frac{1}{4}$	1	$-\frac{7}{8}$	$\frac{31}{4}$																																				
y	0	1	$\frac{1}{8}$	$-\frac{1}{4}$	0	$\frac{3}{8}$	$\frac{1}{4}$																																				
P	0	0	$\frac{21}{8}$	$\frac{21}{8}$	0	$\frac{7}{8}$	$\frac{189}{4}$																																				
$P = 47\frac{1}{4}$ $x = 11\frac{1}{2}$, $y = \frac{1}{4}$, $z = 0$		M1 A1 A1 (3)																																									
(c) There is some slack ($7\frac{3}{4}$) on S , so <i>do not</i> increase blending; therefore increase Processing and Packing which are both at their limit at present		B2, 1,0 (2)																																									
		(17 marks)																																									