

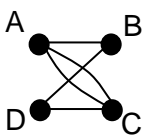
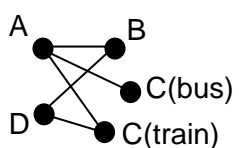
**Mark Scheme 4771
June 2007**

4771

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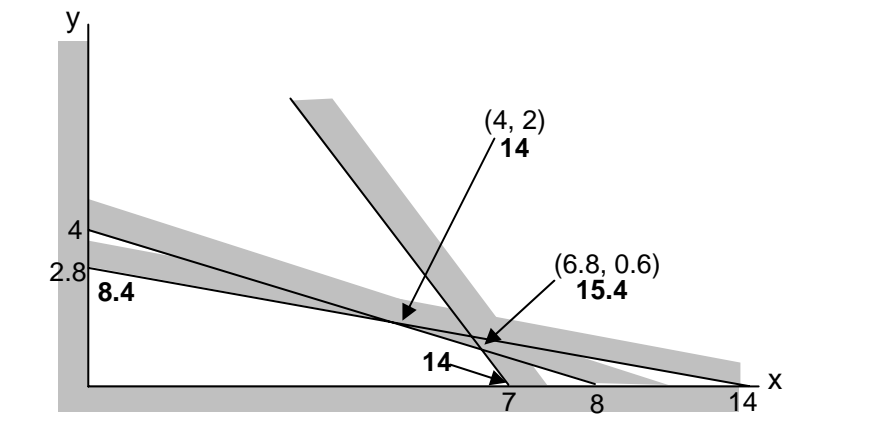
1.

<p>(i)</p> 	<p>M1 4 nodes and 5 arcs A1</p>
<p>(ii) No. Two arcs AC.</p>	<p>M1 A1</p>
<p>(iii)</p> 	<p>M1 5 nodes and 5 arcs A1</p>
<p>(iv) No. ABDC(train)A is a cycle.</p>	<p>M1 A1</p>

2.

<p>(i) Rucksack 1: 14; 6 Rucksack 2: 11; 9 final item will not fit.</p>	<p>M1 6 must be in R1 A1 B1</p>
<p>(ii) Order: 14, 11, 9, 6, 6 Rucksack 1: 14; 11 Rucksack 2: 9; 6; 6</p>	<p>B1 ordering M1 11 in R1 A1</p>
<p>(iii) Rucksack 1: 14; 9 Rucksack 2: 11; 6; 6 e.g. weights.</p>	<p>B1 B1</p>

3.

 <p>Optimum of 15.4 at $x = 6.8$ and $y = 0.6$.</p>	<p>B1 axes scaled & used M1 lines A1 shading B1 two intersection M1 points A1 solution A1 (or by using the objective gradient to identify the optimal point)</p>
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4.

(i)

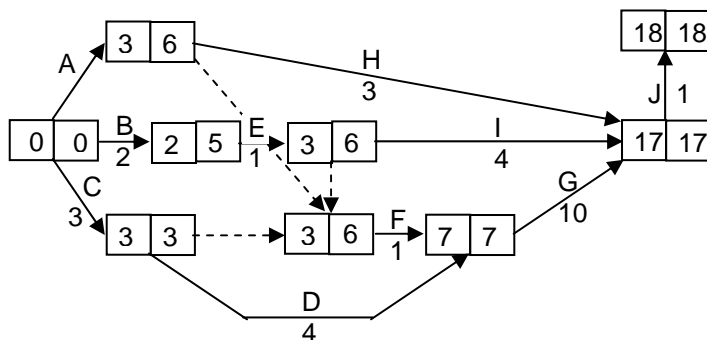
Activity	Duration (minutes)	Immediate predecessors	
A	Rig foresail	3	–
B	Lower sprayhood	2	–
C	Start engine	3	–
D	Pump out bilges	4	C
E	Rig mainsail	1	B
F	Cast off mooring ropes	1	A, C, E
G	Motor out of harbour	10	D, F
H	Raise foresail	3	A
I	Raise mainsail	4	E
J	Stop engine and start sailing	1	G, H, I

B1 A, B, C,
D, E, H & I

B1 F

B1 G and J

(ii)



Critical activities: C; D; G; J
Project duration: 18 minutes

M1 A1 forward pass
M1 A1 backward pass

(iii) H and I

B1
B1

(iv) 25 mins

B1
B1

Must do A, B, E, C, F, D (in appropriate order) then H and I with G, then J.

B1

(v) 18 mins

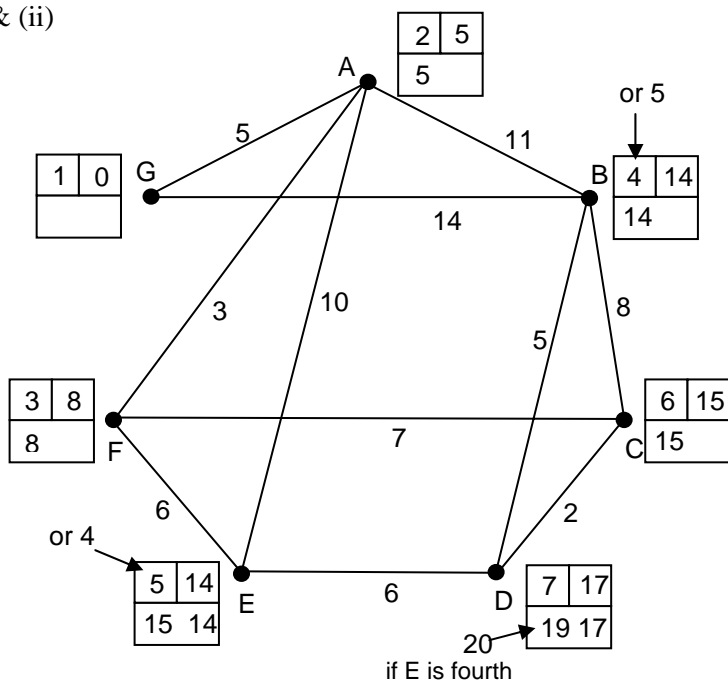
B1

e.g. Colin does C, D
Crew does A, B, E, F
Thence G et al

B1
B1
B1

5.

(i) & (ii)



Route: G A F C D Weight: 17

(iii) Route: G B C F E D or G B A E D Weight: 6
Any capacitated route application.

(iv) Compute $\min(\text{label}, \text{arc})$ and update working value if result is larger than current working value.
Label unlabelled vertex with largest working value.

M1
A1 arcs
A1 arc weights

M1 Dijkstra
A1 labels
A1 order of labelling
A2 working values

B1 B1

B1 B1
B1

B1 B1

B1

6.

(i)(a) e.g. Dry: 00 – 39 Wet: 40 – 69 Snowy: 70 – 99	M1 proportions A1 efficient
(b) e.g. Dry: 00 – 19 Wet: 20 – 69 Snowy: 70 – 99	M1 proportions A1 efficient
(c) e.g. Dry: 00 – 27 Wet: 28 – 55 Snowy: 56 – 97 Reject: 98 & 99	M1 reject some A1 proportions A1 reject 2
(ii) D (today) → D → S → S → W → S → D → D	M1 applying their rules sometimes A1 dry rules A1 wet rules A1 snowy rules
(iii) 3/7 (or 4/8)	B1
(iv) a (much) longer simulation run, with a "settling in" period ignored.	B1 B1
(v) Defining days as dry, wet or snowy is problematical. Assuming that the transition probabilities remain constant. Weather depends on more than just previous day's weather	B1 B1