Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	6	8	9	/	0	1	Signature	

Paper Reference(s)

6689/01

Examiner's use only

Team Leader's use only

Edexcel GCE

Decision Mathematics D1

Advanced/Advanced Subsidiary

Wednesday 19 January 2011 – Afternoon

Answer Book

Do not return the question paper with the answer book

Solutions

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
Total	

Printer's Log. No.
N35412A
W850/R6689/57570 5/5/3/3/2

Turn over

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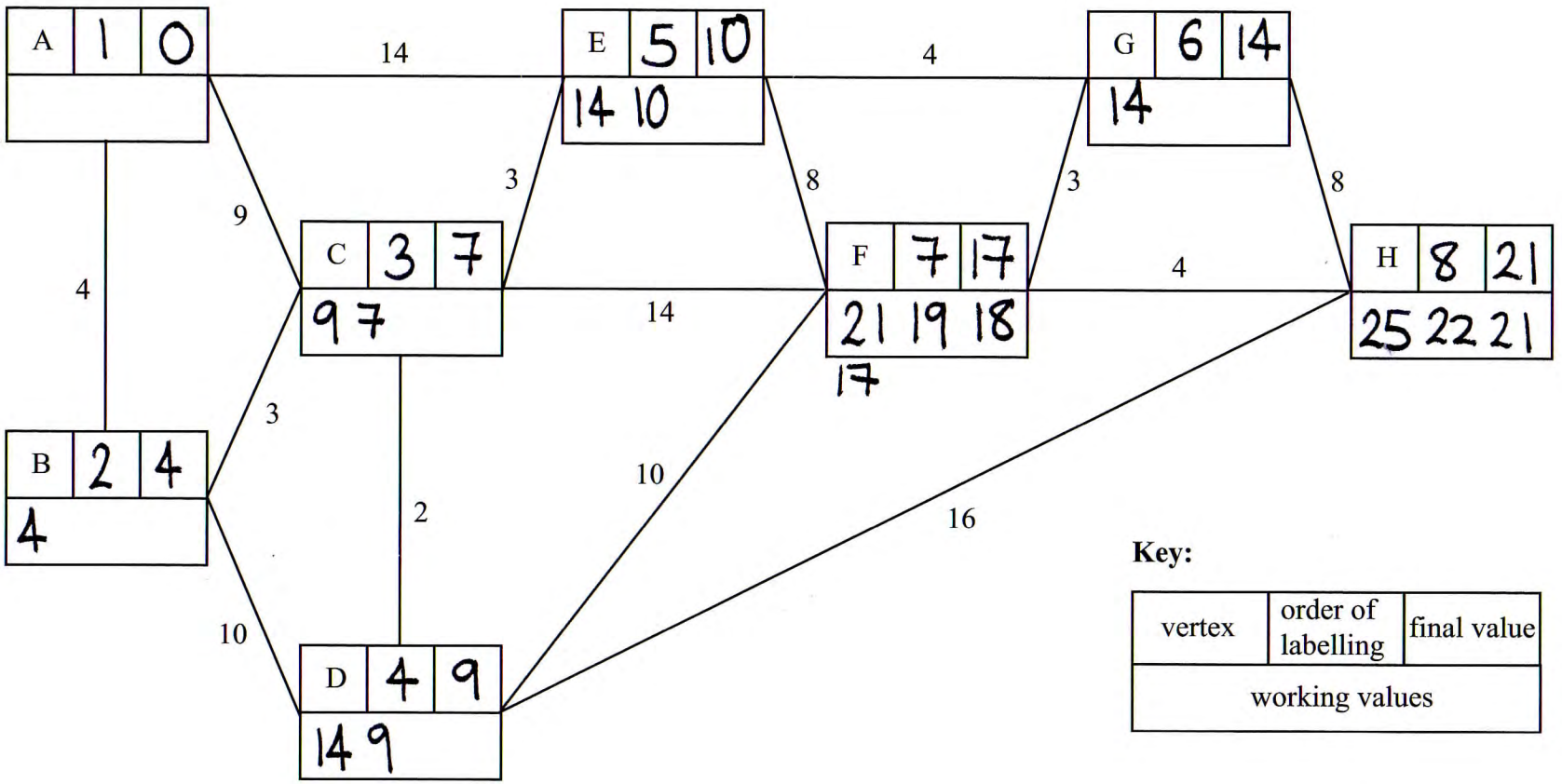
1. (a)



Key:

vertex	order of labelling	final value
working values		

Shortest distance A to H: 21 miles

Leave blank

Question 1 continued

(b) ABCEGFH

(c) HFGEC length 14

(Total 8 marks)

Q1

Leave blank

Turn over

Leave blank

2.

23 29 11 34 10 14 35 17

a) $23+29+11+34+10+14+35+17 = 173$

$\frac{173}{50} = 3.46$ ∴ lower bound = 4 discs

b)

Bin1	Bin2	Bin3	Bin4	Bin5
23	29	34	35	17
11	14			
10				

c) 29 23 34 11 14 35 17 (10)

29 34 23 14 35 17 (11) (10)

34 29 23 35 17 (14) (11) (10)

34 29 35 23 (17) (14) (11) (10)

34 35 29 (23) (17) (14) (11) (10)

~~35~~ ~~34~~ (29) (23) (17) (14) (11) (10)

On next pass No swaps so stop.

d)

Bin1	Bin2	Bin3	Bin4
~~35~~	~~34~~	29	23
14	11	17	10

Leave blank

3.

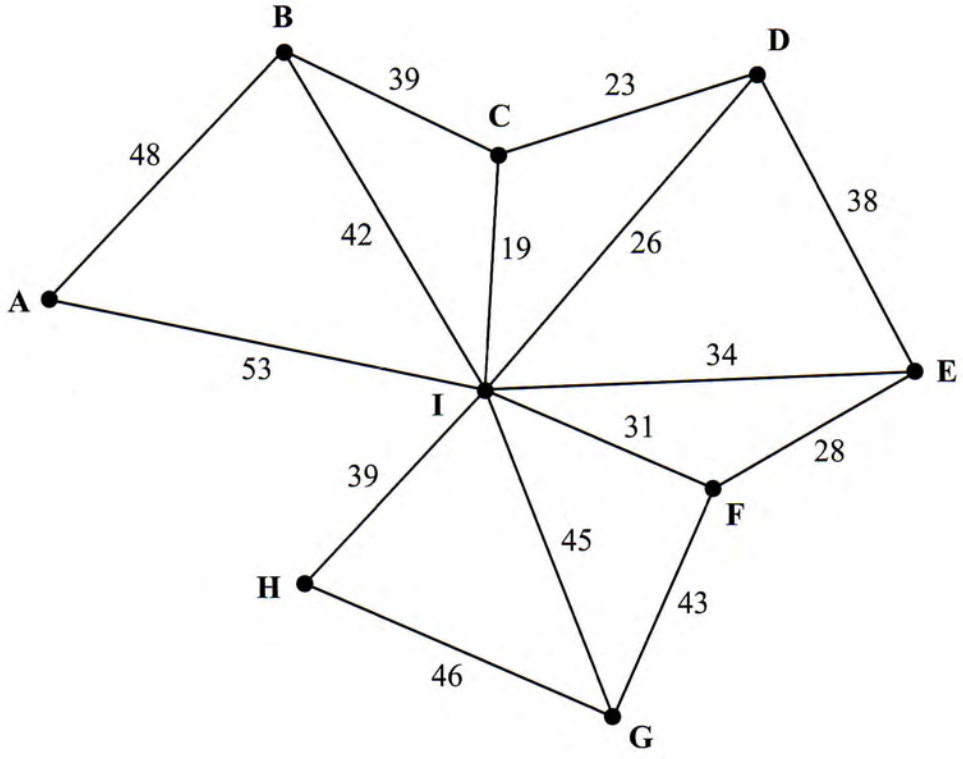


Figure 2

(a) CI, CD, DIrej, EF, FI, DErej, $\binom{BC}{HI}$, BIrej, FG, IGrej, HGrej, AB stop

Leave blank

Question 3 continued

(b) AB, BC, CI, CD, IF, FE, IH, FG

(c)

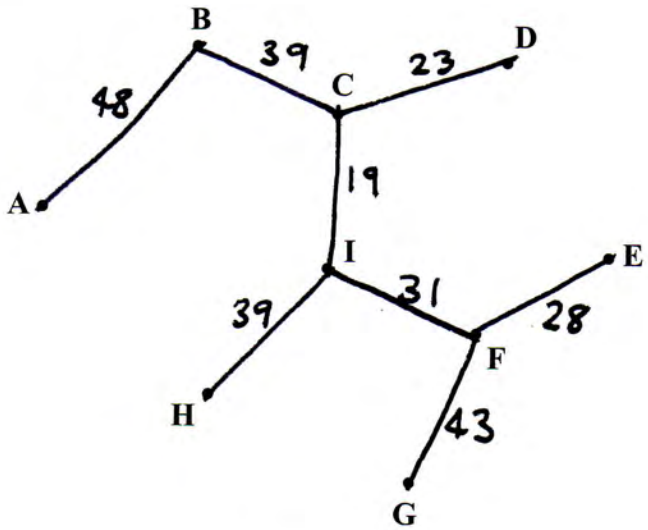


Diagram 1

Weight of minimum spanning tree: 270

(d) Use Kruskal's algorithm. Start by adding DI and HG and the proceed with Krustal's as normal.

Q3

(Total 10 marks)

Leave blank

4.

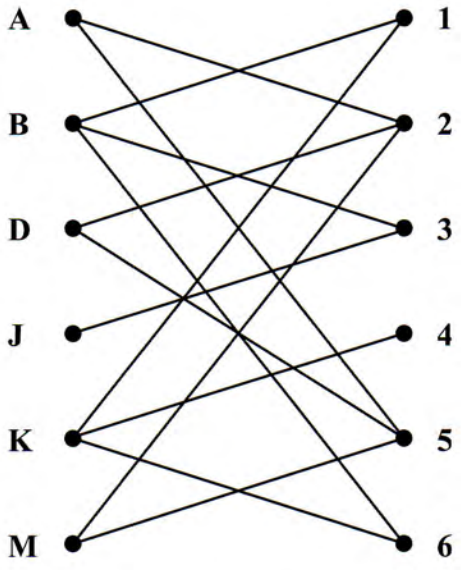


Figure 3

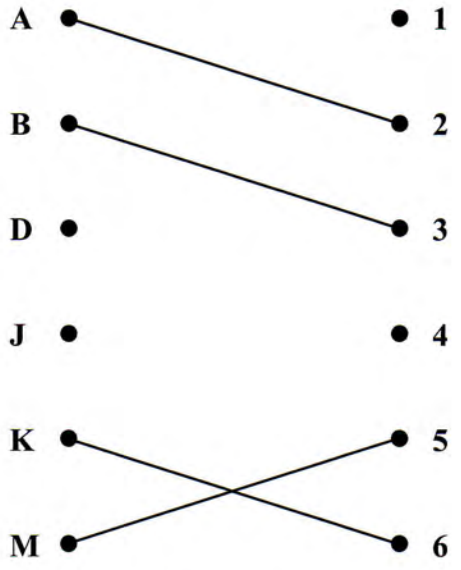


Figure 4

a) Bipartite Graph

b) $J-3=B-6=k-4$

c.s

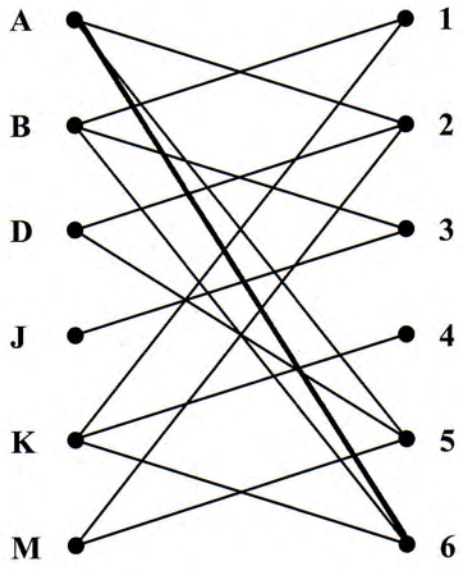
$J=3-B=6-k=4$

improved matching: $A=2$
$B=6$
D
$J=3$
$K=4$
$M=5$

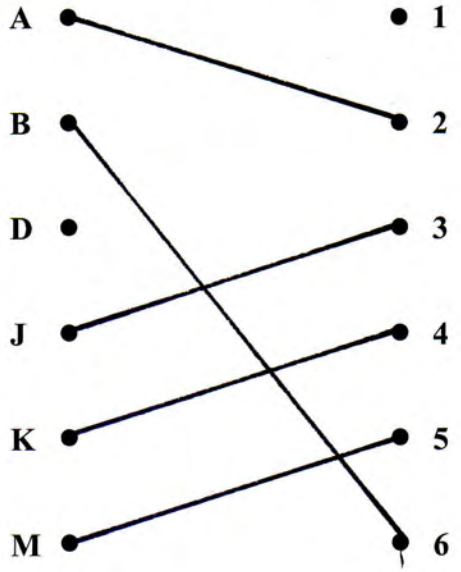
* There are a number of different solutions to this question *

Leave blank

Question 4 continued



initial match



c) $D-2=A-6=B-1$

c.s

$D=2-A=6-B=1$

complete match : $A=6$

$B=1$

$D=2$

$J=3$

$K=4$

$M=5$

Q4

(Total 7 marks)

Leave blank

5. a) Odd nodes A, D, F, I

AD = 4.5	AF = 5.8	AI = 5.9
FI = 5.3	DI = 3.9	DF = 5.1
9.8	9.7	11.0

Repeat edges AE, EF and DG, GI

Possible route: ABDGIGDEIHFCAEFEA

b) traverse AE, EF, DG and GI twice

length = 31.6 + 9.7 = 41.3 km

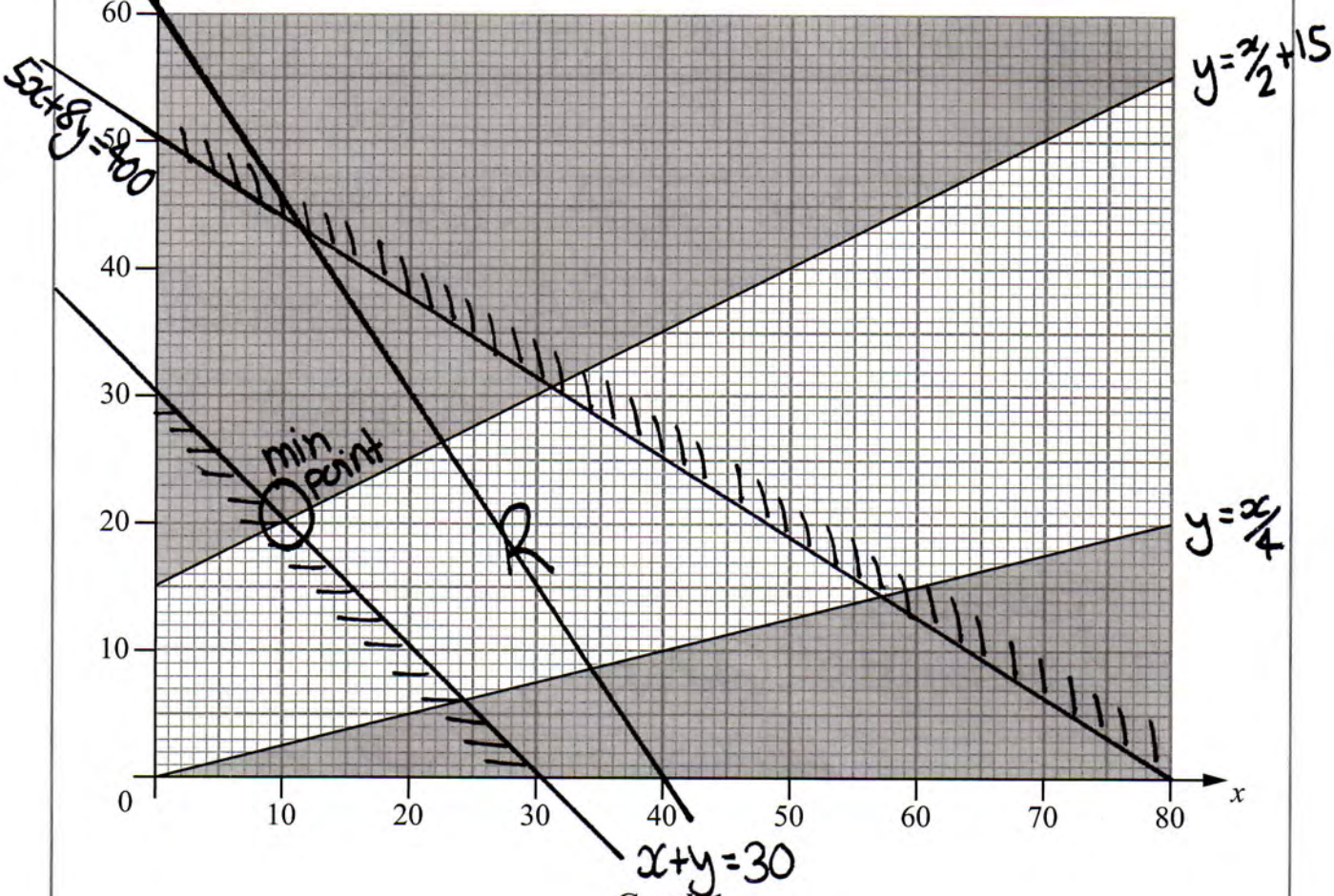
c) Start at D, finish at A as this leaves FI (FH, HI) to traverse twice length 5.3.
The other choices are:

finish at I (repeat AF = 5.8)
" " F (repeat AI = 5.9)

both longer than 5.3.

Leave blank

6. Profit line $15x+10y=600$



Graph 1

a) $y \leq \frac{x}{4}$ (since grad $= \frac{1}{4}$)

$y \geq \frac{x}{2}+15$ (since grad $= \frac{1}{2}$ intercept $= 15$)

c) min point at $(10,20)$

$\therefore$ Profit $= 15\times10+20\times10$

$= 150+200$

$= \underline{\underline{350}}$

Leave blank

7. (a)

Activity	Immediately preceding activities
A	-
B	-
C	A
D	A
E	A
F	B, C
G	B, C
H	E, F
I	D, E, F
J	H, G
K	I, H, G
L	I, H, G

Precedence table

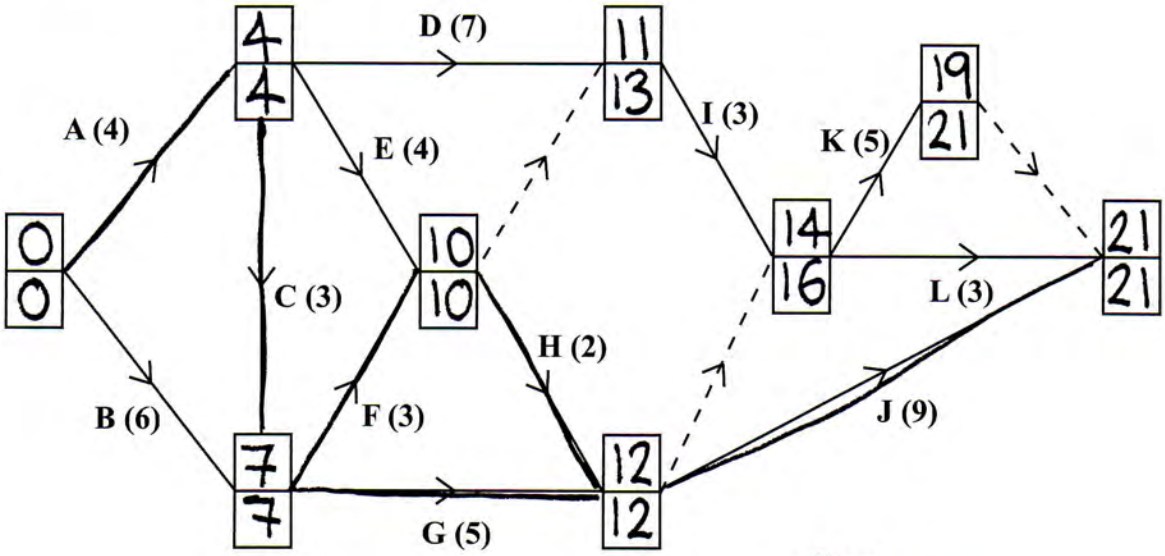
(b) I) To show dependence; K and L depend I, H and G while J depends on H and G only

II) For uniqueness; each activity must uniquely be expressed in terms of start and end events.

Leave blank

Question 7 continued

(c)



Key:

Early event time
Late event time

Diagram 2

(d) Critical Activities: A, C, (F, H, G), J

(e) 21 − 5 − 14 = 2

(f) sum of durations = 54

$\frac{54}{21} = 2.57\ldots$ ∴ lower bound = 3

Q7

(Total 16 marks)

TOTAL FOR PAPER: 75 MARKS

END