Pearson Edexcel Level 3 GCE

Friday 23 June 2023

Afternoon (Time: 1 hour 30 minutes)

Paper reference **9FM0/3D**

Further Mathematics

Advanced

PAPER 3D: Decision Mathematics 1

P72799A0120

1.

Figure 1

(e) Initial time matrix

	A	B	C	D	E
A	–				
B		–			
C			–		
D				–	
E					–

(f) Final iteration

	A	B	C	D	E
A	–				
B		–			
C			–		
D				–	
E					–

(Total for Question 1 is 7 marks)

2.

A(3) B(5) E(1) H(1)

C(4) F(2)

D(7) G(4)

Key:

Early event time
Late event time

Diagram 1

Question 2 continued

Number of workers

8
7
6
5
4
3
2
1

O 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Time (hours)

Grid 1

_____

_____

_____

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(Total for Question 2 is 7 marks)

P 7 2 7 9 9 A 0 5 2 0

3.
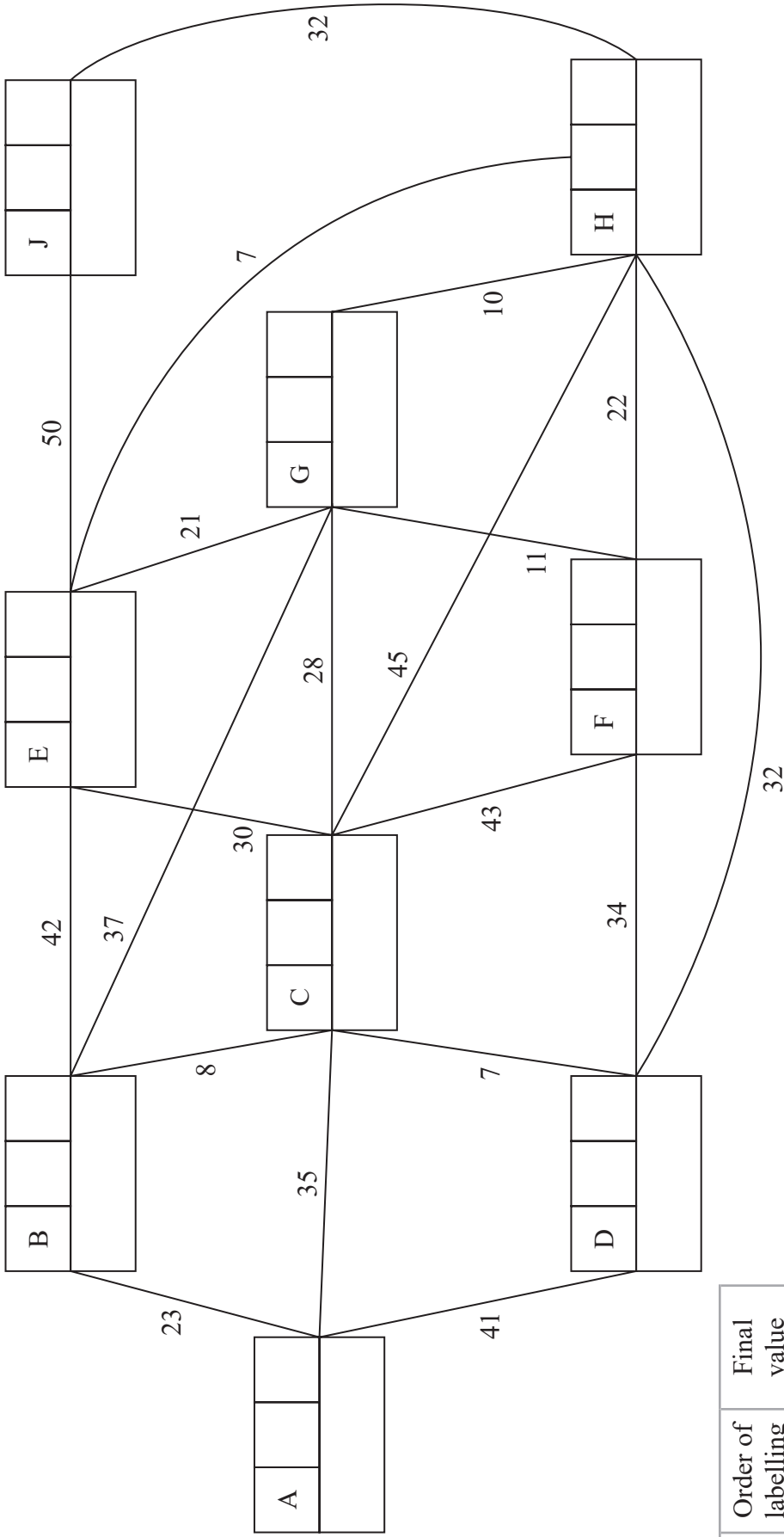
Key:

Vertex	Order of labelling	Final value
Working values		

Shortest path from A to J: _____

Length of shortest path from A to J: _____

Question 3 continued

(Total for Question 3 is 8 marks)

4.

15   22   3   9   23 x 5   4   18   20   13

Question 4 continued

| 15 | 22 | 3 | 9 | 23 | x | 5 | 4 | 18 | 20 | 13 |

15   22   3   9   23 x 5   4   18   20   13

Question 4 continued

| 15 | 22 | 3 | 9 | 23 | x | 5 | 4 | 18 | 20 | 13 |

(Total for Question 4 is 12 marks)

5.

	A	B	C	D	E	F	G	H	J
A	–	34	51	31	79	20	8	55	61
B	34	–	17	65	45	54	42	21	27
C	51	17	–	82	28	71	59	22	10
D	31	65	82	–	87	22	23	86	92
E	79	45	28	87	–	65	87	30	18
F	20	54	71	22	65	–	28	75	81
G	8	42	59	23	87	28	–	63	69
H	55	21	22	86	30	75	63	–	12
J	61	27	10	92	18	81	69	12	–

	A	B	C	D	E	F	G	H	J
A	–	34	51	31	79	20	8	55	61
B	34	–	17	65	45	54	42	21	27
C	51	17	–	82	28	71	59	22	10
D	31	65	82	–	87	22	23	86	92
E	79	45	28	87	–	65	87	30	18
F	20	54	71	22	65	–	28	75	81
G	8	42	59	23	87	28	–	63	69
H	55	21	22	86	30	75	63	–	12
J	61	27	10	92	18	81	69	12	–

Question 5 continued

	A	B	C	D	E	F	G	H	J
A	–	34	51	31	79	20	8	55	61
B	34	–	17	65	45	54	42	21	27
C	51	17	–	82	28	71	59	22	10
D	31	65	82	–	87	22	23	86	92
E	79	45	28	87	–	65	87	30	18
F	20	54	71	22	65	–	28	75	81
G	8	42	59	23	87	28	–	63	69
H	55	21	22	86	30	75	63	–	12
J	61	27	10	92	18	81	69	12	–

	A	B	C	D	E	F	G	H	J
A	–	34	51	31	79	20	8	55	61
B	34	–	17	65	45	54	42	21	27
C	51	17	–	82	28	71	59	22	10
D	31	65	82	–	87	22	23	86	92
E	79	45	28	87	–	65	87	30	18
F	20	54	71	22	65	–	28	75	81
G	8	42	59	23	87	28	–	63	69
H	55	21	22	86	30	75	63	–	12
J	61	27	10	92	18	81	69	12	–

(Total for Question 5 is 13 marks)

6.

Question 6 continued

7.

b.v.	x	y	z							Value
P										
I										

Parts (c), (d) and (e) to be answered on the next page.

b.v.	x	y	z	s_1	s_2	s_3	s_4	Value
s_1	0	0	0	1	1	3	0	600
z	0	$\dfrac{4}{11}$	1	0	$-\dfrac{1}{11}$	$\dfrac{1}{11}$	0	$\dfrac{2000}{11}$
x	1	$\dfrac{7}{11}$	0	0	$\dfrac{1}{11}$	$-\dfrac{12}{11}$	0	$\dfrac{15600}{11}$
s_4	0	$\dfrac{40}{11}$	0	0	$\dfrac{1}{11}$	$-\dfrac{12}{11}$	1	$\dfrac{15600}{11}$
P	0	$-\dfrac{4}{11}$	0	0	$-\dfrac{32}{11}$	$-\dfrac{56}{11}$	0	$\dfrac{204800}{11}$

b.v.	x	y	z	s_1	s_2	s_3	s_4	Value	Row Ops
P									

(Total for Question 7 is 19 marks)

TOTAL FOR PAPER IS 75 MARKS