GENERAL MATHEMATICS 2024

Unit 4
Key Topic Test 9 – Networks and Decision Mathematics: Scheduling Problems

Recommended writing time*: 45 minutes
Total number of marks available: 25 marks

SOLUTIONS

SECTION A – Multiple Choice (1 mark per question)

Question 1
Answer: B

A – D – E – H = 13
A – C – G = 14

Activity K cannot begin until activities H and G are complete, 14 hours

Question 2
Answer: A

Minimum completion time = 21 hours
Critical path = A – C – G - K

Question 3
Answer: C

EST (F) = 25
LST (F) = 27

Question 4
Answer: B

Critical path = A – B – D – J – L
Minimum completion time = 60 days

Question 5
Answer: D

Any activity not on the critical path can be delayed
C, E, F, G, H, I, K = 7 activities

SECTION B – Short Answer

Question 1

Activity	Immediate Predecessor	EST	LST	Float
A	-	0	0	0
B	-	0	2	2
C	-	0	5	5
D	A	6	9	3
E	A	6	6	0
F	C	5	10	5
G	B, E	10	10	0
H	B, E	10	13	3
I	B, E	10	11	1
J	D, G	14	18	4
K	D, G	14	14	0
L	H, K	15	15	0
M	F, I	12	13	1

a. Immediate Predecessor for I = B, E

1 mark

b. EST (G) = 10 days

1 mark

c. Float time (F) $= 10 - 8 = 2$ days

1 mark

d. Critical path (float time 0) = A – E – G – K – L
Minimum completion time = 22 days

2 marks

e. Activities A or E

- If activity G is reduced by 1, A – E – I – M also becomes critical
- If activity L is reduced by 1, A – E – I – M also becomes critical
- Activity K can not be reduced by more than 1 day

2 marks

f. New completion time is 20 hours

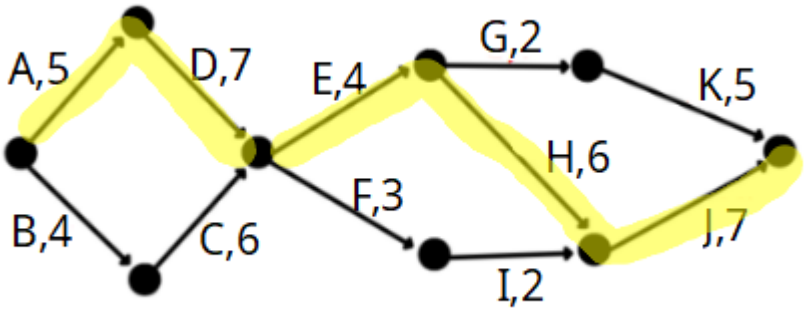
1 mark

Question 2

a. 29 minutes

1 mark

b.



1 mark

c. Activity G and K have the largest float time (6 minutes)

Activity	Float time
A	0
B	2
C	2
D	0
E	0
F	5
G	6
H	0
I	5
J	0
K	6

1 mark

d. Activity D can be reduced by a maximum of 2 minutes until B – C – E – H – J also becomes critical.

Shortest completion time is now 27 minutes.

2 marks

Question 3

a. $T, 0$ is a dummy activity. It is required to indicate that activity I has immediate predecessors of E, F and H. However activity G has immediate predecessors of E only.

1 mark

b. Completion time = 32
$32 - 18 = 14$
$K = 14$ hours

1 mark

c. $EST\ (D) = 5$
$LST(D) = 9$

$13 - 9 = 4$
D = 4 hours duration

1 mark

d. B – C – E – G – J – K

1 mark

e. 15 hours

1 mark

f.

Hours	Reduction/s	Minimum Cost	Reasoning
15	-	-	
14	$F \times 1$	60	Reduce activity on critical path with lowest cost
13	$F \times 2$	120	Reduce activity on critical path with lowest cost Critical path now: B – C – F – I and B – C – E – I
12	$F \times 2$ $B \times 1$	210	E – not on both critical paths so won't reduce completion time Critical paths now: B – C – F – I, B – C – E – I, A – F – I, A – E - I
11	Not possible		Reducing A does not reduce all critical paths Reducing E does not reduce all critical paths Activities B and F have no further reductions

Minimum completion time = 12 hours
Minimum cost = $210

END OF KEY TOPIC TEST SOLUTIONS