Networks, scheduling and assignment - Test 5

Name: _____ Date: _____

10 questions | 55 marks | 75 minutes

Critique scheduling claims and test how deadlines, cost changes and ties affect recommendations.

A scientific calculator may be used.

1. Use the film-production project. [6 marks]

Producing a short film; durations are in days.

Activity	Duration	Immediate predecessors
A	3	None
B	2	None
C	6	A
D	4	A
E	3	B and D
F	2	C and E

(a) Find all earliest activity start/finish times. [4 marks]

(b) Identify the critical path and minimum completion. [2 marks]

2. Use the film project with a finish target of 12 days. [6 marks]

Producing a short film; durations are in days.

Activity	Duration	Immediate predecessors
A	3	None
B	2	None
C	6	A
D	4	A
E	3	B and D
F	2	C and E

(a) Calculate the total floats of B and C. [3 marks]

(b) Assess a separate extension of B from 2 to 8 days. [3 marks]

3. The film project's contracted deadline is day 15 rather than the earliest day 12. [5 marks]

Producing a short film; durations are in days.

Activity	Duration	Immediate predecessors
A	3	None
B	2	None
C	6	A
D	4	A
E	3	B and D
F	2	C and E

(a) Find latest start times for B and C using the day 15 deadline. [3 marks]

(b) Explain why these are later than the no-delay latest starts. [2 marks]

4. Each alteration to the film project is made separately. [6 marks]

Producing a short film; durations are in days.

Activity	Duration	Immediate predecessors
A	3	None
B	2	None
C	6	A
D	4	A
E	3	B and D
F	2	C and E

(a) Reduce D from 4 to 2 days. Find the new finish. [3 marks]

(b) Increase C from 6 to 8 days. Find the finish and controlling route. [3 marks]

5. Ali's cost for job 2 in the technician table changes from AUD 2 to x dollars, with $x \geq 0$; all other entries stay fixed. [6 marks]

Cost ($) of assigning one technician to each job.

Technician	Job 1	Job 2	Job 3
Ali	9	2	7
Bea	6	4	3
Chen	5	8	1

(a) Write the cost of Ali→2, Bea→1, Chen→3 in terms of x. [2 marks]

(b) Find the range of x for which this assignment remains optimal, and describe the boundary tie. [4 marks]

6. Use the cost table with two optimal pairings. [6 marks]

Assignment costs ($).

Worker	1	2	3
A	4	4	9
B	4	4	9
C	9	9	1

(a) Find both minimum assignments. [3 marks]

(b) Suppose A/job 1 is unavailable. Does the minimum cost change? [2 marks]

(c) Give one non-numerical criterion that could choose between tied optima when both are available. [1 mark]

7. A reduced 3×3 matrix has rows $\begin{bmatrix} 0 & 2 & 0 \\ 0 & 3 & 0 \\ 1 & 0 & 4 \end{bmatrix}$. [5 marks]

(a) Find two complete independent-zero assignments. [3 marks]

(b) Do different zero assignments necessarily give different original totals? Explain. [2 marks]

8. Use the net-profit table, whose units are \$100. [6 marks]

Net profit (\$100 units); negative entries are losses.

Team	1	2	3
A	5	-2	3
B	4	6	-1
C	-3	2	7

(a) Find the maximum original profit. [3 marks]

(b) A fixed \$300 fee is charged for every selected contract. Find the new maximum profit and say whether the pairing changes. [3 marks]

9. A supervisor uses these statements about a project: 'The dummy lasts zero, so it can be deleted' and 'The shortest route is the critical path'. [4 marks]

(a) Correct the dummy statement. [2 marks]

(b) Correct the critical-path statement. [2 marks]

10. An assignment table gives estimated costs within $\pm\$2$ per selected entry. Two feasible three-person allocations have predicted totals \$40 and \$41. [5 marks]

(a) Can the model's one-dollar preference guarantee that the first allocation is cheaper in practice? Explain. [2 marks]

(b) Describe a useful next check before making a recommendation. [2 marks]

(c) Why should the calculation still use exact supplied values before the interpretation? [1 mark]