Networks, scheduling and assignment - Test 2

Name: _____ Date: _____

10 questions | 59 marks | 65 minutes

Develop scheduling calculations and compare minimum-cost, maximum-profit and rectangular assignments.

A scientific calculator may be used.

1. Use the exhibition-project table. [6 marks]

A community exhibition project; durations are in hours.

Activity	Duration	Immediate predecessors
A	3	None
B	5	None
C	4	A
D	2	A
E	6	B
F	3	C and D
G	2	E and F

(a) Draw an activity-on-arrow network with the stated dependencies. Explain where a zero-duration logical connection may be needed. [3 marks]

(b) Find the earliest start of F and G. [3 marks]

2. Use the exhibition project again. [7 marks]

A community exhibition project; durations are in hours.

Activity	Duration	Immediate predecessors
A	3	None
B	5	None
C	4	A
D	2	A
E	6	B
F	3	C and D
G	2	E and F

(a) Find the minimum completion and a critical path. [3 marks]

(b) Find the latest starts of A, C, D, F. [4 marks]

3. In the exhibition project, assess each separate change. [6 marks]

A community exhibition project; durations are in hours.

Activity	Duration	Immediate predecessors
A	3	None
B	5	None
C	4	A
D	2	A
E	6	B
F	3	C and D
G	2	E and F

(a) Increase F from 3 to 5 hours. [3 marks]

(b) Reduce E from 6 to 4 hours. [3 marks]

4. Use the exhibition project to discuss float. [6 marks]

A community exhibition project; durations are in hours.

Activity	Duration	Immediate predecessors
A	3	None
B	5	None
C	4	A
D	2	A
E	6	B
F	3	C and D
G	2	E and F

(a) Find the floats of A, C, D, F. [3 marks]

(b) A and C are each extended by 1 hour. Find the new project finish and explain the shared allowance. [3 marks]

5. A different project has two independent routes lasting 10 and 14 hours, followed by a common 3-hour final activity. [5 marks]

(a) Find the earliest finish and the maximum extension of the shorter route that preserves it. [3 marks]

(b) The shorter route needs a machine also used by the longer route. Explain why the answer may need revision. [2 marks]

6. Minimise the repair times in the table. [6 marks]

Time in hours for one worker to complete one separate repair.

Worker	X	Y	Z
A	7	4	9
B	6	8	5
C	9	3	7

(a) Show row reduction. [3 marks]

(b) Find the optimum assignment and original total. [3 marks]

7. Use the four-worker cost table. [6 marks]

Assignment costs ($). Each worker does one job.

Worker	1	2	3	4
A	8	3	7	6
B	5	9	4	8
C	6	7	2	5
D	7	4	8	3

(a) Find a minimum complete assignment. [4 marks]

(b) Explain why the sum of the four row minima is not immediately a feasible assignment. [2 marks]

8. The contract-profit table uses $1,000 units. [6 marks]

Contract profit in $1,000 units.

Team	1	2	3	4
A	14	18	12	11
B	16	13	15	12
C	10	16	14	17
D	15	11	18	14

(a) Find the maximum profit and corresponding pairing. [4 marks]

(b) Explain why taking the row maxima is sufficient for this particular table but not a general rule. [2 marks]

9. Use the two-worker table, where leaving one job unfilled is permitted at its stated penalty. [6 marks]

Costs ($), including a permitted unfilled-job penalty row.

Resource	1	2	3
A	6	4	8
B	5	7	3
Unfilled	10	2	7

(a) Find the optimum and identify the unfilled job. [4 marks]

(b) Would the same dummy row be valid if every job had to be physically completed? Explain. [2 marks]

10. A dispatcher compares two feasible assignments. Allocation U gives driving times 2,3,12 hours. Allocation V gives 5,6,7 hours. All drivers leave together. [5 marks]

(a) Choose the assignment minimising total driving hours. [2 marks]

(b) Choose the assignment minimising latest arrival, and explain why this differs. [3 marks]