Minimum completion time

6 questions | 16 marks

Equivalent correct methods earn the corresponding marks.

1. Find the display project's total activity duration and its earliest elapsed completion.
[3 marks]

A school display project. Times are in days.

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

Sum $4+3+5+4+2+3=21$.

The controlling route A-D-E-F takes 13.

Answer: 21 task-days; 13 elapsed days.

2. Reduce D in the display project from 4 to 3 days. Find the new completion and all critical real-activity paths. [3 marks]

A school display project. Times are in days.

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

The changed D route is $4+3+2+3=12$.

The C route remains $4+5+3=12$.

Answer: 12 days; A-D-E-F and A-C-F.

3. Instead reduce D from 4 to 1 day. Find the new project completion. [3 marks]

A school display project. Times are in days.

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

The D route becomes $4+1+2+3=10$.

The unchanged A-C-F route still needs 12.

Answer: 12 days.

4. Two independent tasks each last 6 hours but need the same one available operator. A final 1-hour task follows both. Compare the dependency-only minimum with a schedule respecting the operator limit. [3 marks]

Parallel model: $\max(6, 6) + 1 = 7$.

One operator must do the two tasks sequentially: $6 + 6 + 1 = 13$.

Answer: Dependency-only minimum 7 hours; with one operator, 13 hours.

5. A project has a 22-day critical path and a 21-day alternative. A one-day reduction is available on a task shared by both routes. What revised completion results? [2 marks]

Both path durations fall by one.

They become 21 and 20; the maximum is 21.

Answer: 21 days.

6. A contractor promises the exact network minimum with no allowance for uncertainty. Give two assumptions that should be checked. [2 marks]

The calculation uses fixed durations and immediate starts.

Supply delays, resource conflicts or rework can invalidate these assumptions.

Answer: For example: the activity durations are reliable, and enough independent resources exist for parallel tasks.