2 CHAPTER
Crashing of Networks and Engineering Economy

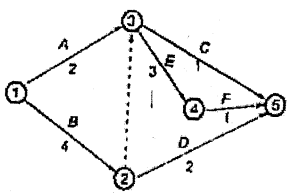
Q.1 If T_o = Optimum project schedule and T_n = Normal project schedule then
(a) $T_o = T_n$ (b) $T_o \leq T_n$
(c) $T_o > T_n$ (d) $T_o \geq T_n$

Q.2 In cost time optimization of a project, the project can be crashed by expediting
(a) all activities on the critical path
(b) critical activities having minimum cost slope
(c) activities on sub critical path
(d) all activities of the network

Question 3-5 are based on the data given below:
A project with the following data is to be implemented:

Activity	Predecessor(s)	Duration (days)	Cost (Rs/day)
A	-	2	50
B	-	4	50
C	A	1	40
D	B	2	100
E	A,B	3	100
F	E	1	60

The network showing various activities is shown in the figure below:



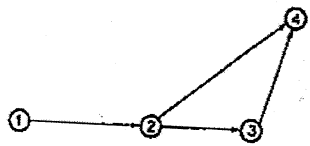
Q.3 The minimum duration of the project is
(a) 5 days (b) 6 days
(c) 7 days (d) 8 days

Q.4 The peak requirement of money will be
(a) ₹ 150 (b) ₹ 175
(c) ₹ 240 (d) ₹ 250

Q.5 The peak requirement of money will occur on
(a) 4th day (b) 5th day
(c) 6th day (d) 7th day

Q.6 Which of the following represents the reduction in duration?
(a) Crashing (b) Negative slack
(c) Variance (d) All of the above

Data for Questions 7 and 8:
A project consisting of four activities is shown below:



Normal duration time and crash time for each activity are given below:

Activity (days)	Normal time (days)	Crash time (days)
1-2	3	2
2-3	4	2
2-4	5	4
3-4	7	5

Q.7 The minimum time required for the completion of project is
(a) 9 days (b) 13 days
(c) 14 days (d) 19 days

Q.8 The normal time required for the completion of project in the above problem is
(a) 9 days (b) 13 days
(c) 14 days (d) 19 days

Q.9 The reduction in project time normally results in
(a) decreasing the direct cost and increasing indirect cost
(b) increasing the direct cost and decreasing the indirect cost
(c) increasing the direct cost and indirect cost both
(d) decreasing the direct cost and indirect cost both

Q.10 Economic saving of time results by crashing
(a) cheapest critical activity
(b) cheapest noncritical activity
(c) costliest critical activity
(d) costliest noncritical activity

Q.11 In time-cost optimization of a project, crashing is done
(a) on all the activities
(b) on all the activities lying on the critical paths
(c) only on activities lying on the original critical path and having flatter cost slopes
(d) on original critical activities and those that become critical

Q.12 The effect of network compression is the increase in the
(a) Total cost (b) Direct cost
(c) Indirect cost (d) overheads

Q.13 Assertion (A) : Time cost studies have to be firmed up before the *EOQ* and *ABC* analysis can be undertaken.
Reason (R) : Time cost studies can be premised on no bottlenecks or shortages in materials procurement.
(a) both A and R are true and R is the correct explanation of A.
(b) both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false
(d) A is false but R is true.

Q.14 The requirement of a certain component is uniform at 100 units per month in a construction activity spread over 8 months. The unit cost is ₹ 45, the carrying cost is 9% and the ordering cost is estimated to be ₹ 30 per order. If delivery is instantaneous, it is best to purchase in
(a) a single lot (b) 4 lots
(c) 8 lots (d) 10 lots

Q.15 Total project cost versus time curve is a/an
(a) *S*-shaped curve
(b) parabola
(c) *U*-shaped curve
(d) straight line

Q.16 The optimum duration is the
(a) the summation of normal-durations of each activity in the project
(b) summation of the normal-duration of activities on critical path
(c) one, which gives the minimum total cost for completing the project
(d) summation of crash-time of activities on critical path

Q17 The first cost of a project, not considering aspects of rehabilitation of displaced persons and of needful reforestation, is ₹ 8.2 crores. The expected benefits, discounted for the project construction completion date, are ₹ 11.7 crores. The cost of rehabilitation of displaced persons is ₹ 0.9 crores and cost of needful reforestation in is ₹ 0.7 crores. BCR can be quoted in the range of
(a) 1.19 to 1.23 (b) 1.2 to 1.21
(c) 1.15 to 1.2 (d) 1.15 to 1.23

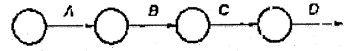
Q.18 A contractor has two options: *I*. Invest his money in project *A* or *II*. Invest his money in project *B*. If he decided to invest in *B*, he is assured of making his money 1.5 times in 5 years. If the contractor values his money at 10% interest rates then he
(a) should invest in neither of the two projects
(b) could invest in either of the two projects
(c) should invest in project *A*
(d) should invest in project *B*

Q.19 In a mass-housing project, break-even point indicates the
(a) amount of total money to be spent
(b) number of houses to be built
(c) number of houses to be built for the best cost/benefit ratio
(d) frequency of houses to be built for maximum profit

Q.20 Assertion (A) : Crashing of construction duration assures better optimal resource utilisation.
Reason (R) : Crashing of activities in a construction project network tends to increase the number of critical activities.
(a) both A and R are true and R is the correct explanation of A.
(b) both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false
(d) A is false but R is true

Q.21 The normal duration and normal cost of an activity are 10 days and ₹ 350, respectively. The cost slope is ₹ 75 per day. If the crash duration is 156 days; then what is the crash cost of the activity?
(a) ₹ 400 (b) ₹ 500
(c) ₹ 600 (d) None of these

Q.22 The three consecutive activities *A*, *B*, and *C* have alternative sets of time-direct cost constributions as given below :



T	DC	T	DC	T	DC
8	100	10	125	8	80
7	120	9	150	7	100
6	145	8	170	6	125

What is the least direct cost in total at 23 days?
(a) 370 (b) 375
(c) 360 (d) 385

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Answers Crashing of Networks and Engineering Economy

1. (b)	2. (a)	3. (d)	4. (c)	5. (b)	6. (a)	7. (a)	8. (c)	9. (b)	10. (a)
11. (c)	12. (b)	13. (b)	14. (c)	15. (c)	16. (c)	17. (a)	18. (a)	19. (c)	20. (b)
21. (b)	22. (a)								

Explanations Crashing of Networks and Engineering Economy

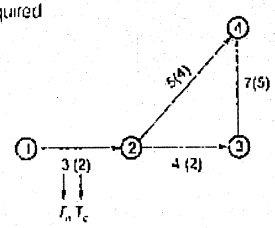
2. (a)
Critical activities having minimum cost slope are expedited first. But finally all the activities on critical path are crashed.

3. (d)
The critical path is
1 – 2 – 3 – 4 – 5
Hence minimum time of project
= 4 + 3 + 1 = 8 days

4. (c)
When activities *D*, *E* and *C* start together, peak cost = 100 + 100 + 40 = 240

5. (b)
Activities *D*, *E* and *C* may start together on 5th day

7. (a)
Under crushed condition, minimum time will be required



Normal Time = 3 + 4 + 7 = 14 days
Minimum Time = 2 + 2 + 5 = 9 days

14. (c)

Economic Order Quantity (EOQ) = $\sqrt{\frac{2DF}{C}}$

D = Demand or rate of use per period (year or month)
F = Fixed cost per order
C = Carrying cost per unit of inventory per same period.
D = $100 \times 8 = 800$
C = $0.09 \times 45 = 4.05$
F = 30

$\therefore EOQ = \sqrt{\frac{2 \times 800 \times 30}{4.05}} = 109$ units

The optimum order quantity will be 100 and number of lots would be 8.

16. (c)

The direct cost increases with decrease in duration while the indirect cost decreases with decrease in duration. The optimum duration in the crashing of activities will correspond to minimum total cost (direct + indirect) of project completion.

17. (a)

Benefit to Cost Ratio (BCR)

$= \frac{\text{Benefits to the public}}{\text{Cost to the Government}}$

$= \frac{11.7}{8.2 + 0.9 + 0.7} = 1.194$

18. (a)

Since interest in compound yearly.

21. (b)

Crash cost = 350 + 2 × 75 = ₹ 500

22. (a)

A – 8 days B – 9 days C – 6 days	$\therefore$	DC = 100 + 150 + 125 = ₹ 375
A – 8 days B – 8 days C – 7 days	$\therefore$	DC = 100 + 170 + 100 = ₹ 370
A – 7 days B – 10 days C – 6 days	$\therefore$	DC = 120 + 150 + 125 = ₹ 370

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