POSTAL Book Package 2021

CIVIL ENGINEERING

Construction, Planning and Management

Objective Practice Sets

Contents

MADE EASY Publications

3 CHAPTER
Crashing of Network and Engineering Economy

Q.1 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

Q.2 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.3 An equipment has a useful life of 4 years after which it is replaced by a new one. If the interest rate is 5%, then the sinking fund factor will be
(a) 0.232 (b) 0.184
(c) 0.423 (d) 0.482

Q.4 For a given activity, cost and time estimates are given below:

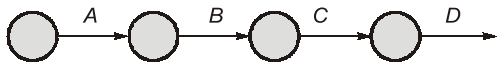
Activity	Normal duration (days)	Normal cost (Rs.)
X	10	6500

Crash cost (Rs.)	Crash duration (days)
8500	5

For time duration of 7 days for activity *X*, direct cost of activity will be Rs. _____.

Q.5 The normal duration and normal cost of an activity are 10 days and Rs. 350, respectively. The cost slope is Rs. 75 per day. If the crash duration is 8 days; then what is the crash cost of the activity?
(a) Rs. 400 (b) Rs. 500
(c) Rs. 600 (d) None of these

Q.6 The three consecutive activities *A*, *B*, and *C* have alternative sets of time (T) direct cost (DC) contributions 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 af 23 days?
(a) 370 (b) 375
(c) 380 (d) 385

Q.7 Three activities implementable in parallel, have the following time-cost relationships for direct cost component in each:
Activity A:
10 days-800 units; 9 days-900 units;
8 days-1000 units
Activity B:
11 days-1200 units; 10 days-1350 units; 9 days-1500 units
Activity C:
7 days-500 units; 6 days-700 units; 5 days-900 units
The feasible range of total direct cost component for the three activities together is
(a) 2500 to 3400 units
(b) 2650 to 3200 units
(c) 2500 to 2900 units
(d) 2600 to 3100 units

Q.8 An equipment is purchased for Rs. 40,000.00 and is fully depreciated by straight line method over 8 years. Considering interest on average annual cost at 15% p.a., the charge on the company due

to use of this equipment, if made uniformly over the 8 years, is

(a) Rs. 5,750 (b) Rs. 8,000
(c) Rs. 8,375 (d) Rs. 14,000

Q.9 Match **List-I** (Cost) with **List-II** (Feature) and select the correct answer using the codes given below the lists:

List-I

A. Optimal cost
B. Overhead cost
C. Direct cost
D. Indirect cost

List-II

1. Activity related
2. Developed by crashing process
3. Project-related
4. Contained in, or contributing exclusively to the related product

Codes:

	A	B	C	D
(a)	4	3	2	1
(b)	2	1	4	3
(c)	4	1	2	3
(d)	2	3	4	1

Directions: Each of the next items consists of two statements, one labeled as the **'Statements (I)'** and the other as **'Statement (II)'**. You are to examine these two statements carefully and select the answers to these items using the codes given below:

Codes:

(a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
(b) Both Statement (I) and Statement (II) are individually true but Statement (II) is NOT the correct explanation of Statement (I)
(c) Statement (I) is true but Statement (II) is false
(d) Statement (I) is false but Statement (II) is true

Q.10 **Statement (I) :** The point of minimum total cost of equipment occurs when the inventory procurement cost is equal to the inventory holding cost.

Statement (II) : The inventory procurement cost is inversely proportional to the size of the lot, and the inventory holding cost is directly proportional to the size of the lot.

Q.11 **Statement (I):** Crashing of project duration always increases the cost of the project on its completion, no matter what the indirect, or outhead, costs are.

Statement (II): The critical path along the project activities network diagram is compressed in the process of investigating the crashing of the project duration, and not the non-critical activities, up to a certain stage of crashing.

Q.12 What does payback method measure?

(a) The duration through which an investment may be recovered
(b) The cash flow from an investment
(c) The economic life of the completed project out of an investment
(d) The profitability of an investment

Q.13 Consider the following statements :

1. Sinking funds are created out of earnings or depreciations.
2. To amortize is to pay off, or satisfy, a debt by means of a sinking fund.'
3. Equivalence implies that unequal usage is compensated by the ROR realizable by the investor.

Which of the above statements is/are correct?

(a) 1 only (b) 1 and 3
(c) 2 only (d) 2 and 3

Q.14 A crane is purchased now with its useful life as 8 years after which a new crane must be purchased. If the interest rate is 6%, then the capital recovery factor (CRF) is

(a) 0.3141 (b) 0.5420
(c) 0.1610 (d) 0.1259

Q.15 A project has four activities viz. *A, B, C* and *D* as shown below.

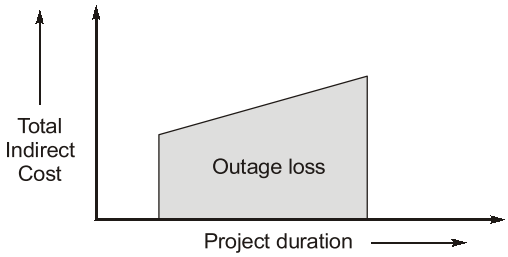
Activity	Normal duration (days)	Crash duration	Predecessor	Cost slope (Rs/day)
A	3	2	—	500
B	7	5	A	100
C	4	2	A	400
D	5	2	C	200

The total cost of normal duration of the project is Rs. 20000 and the overhead cost is Rs. 200 per day. If the project duration has to be crashed down to 9 days, the total cost (in Rs.) of the project will be

(a) 20,700 (b) 20,500
(c) 20,100 (d) 19,800

Q.16 Consider the following statements:

1. The 'crash' estimate in CPM involves the absolute maximum time required for the job and the cost necessary to achieve it.
2. The optimum duration will be one which gives the most economic cost for completing the project.
3. If outage losses are also included in the project cost, the curve for indirect cost versus project duration is represented as given below



Which of the above statement(s) is(are) CORRECT?

(a) 1 and 3 (b) 2 only
(c) 2 and 3 (d) 1, 2 and 3

Q.17 Consider the following statements:

1. Crash time of an activity is that time of completion which can not be reduced further.
2. Direct cost includes the cost of material, labour and equipment.
3. Indirect cost includes administrative cost, depreciation, insurance charges.
4. Direct cost reduces with time whereas indirect cost increases with time.

Which of the above statements are CORRECT?

(a) 1, 2 and 3 (b) 2 and 4
(c) 1, 3 and 4 (d) All of the above

Q.18 A machine cost Rs. 16,000 by constant rate declining balance method of depreciation, its salvage value after an expected life of 3 years is ` 2000. The rate of depreciation is

(a) 0.25 (b) 0.50
(c) 0.30 (d) 0.40

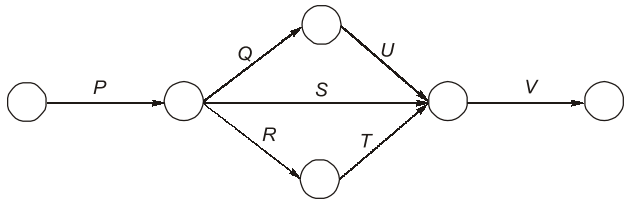
Q.19 A person has an initial debt of Rs. 1,00,000 which is to be repaid by at the end of each month in equal installments for 4 months with an annual interest @ 12% compounded monthly. The amount of each monthly installment will be

(a) Rs. 25628.1 (b) Rs. 30411.1
(c) Rs. 34481.2 (d) Rs. 38848.8

Q.20 A construction equipment costing Rs.10000 has an expected life of 5 years, and has no salvage value. Its book value according to double declining method after 2 years will be

(a) Rs. 3600 (b) Rs. 5000
(c) Rs. 7500 (d) Rs. 6000

Q.21 The network of a small construction project awarded to a contractors is shown in the following figure. The normal duration, crash duration, normal cost and crash cost of all the activities are shown in the table. The indirect cost incurred by the contractor in INR 5000 per day.



Activity	Normal Duration (days)	Crash Duration (days)	Normal cost (INR)	Crash Cost (INR)
P	6	4	15000	25000
Q	5	2	6000	12000
R	5	3	8000	9500
S	6	3	7000	10000
T	3	2	6000	9000
U	2	1	4000	6000
V	4	2	20000	28000

If the project is target for completion in 16 days, the total cost (in INR) to be incurred by the contractor would be_____.

Q.22 For supporting water to a city, two alternate design concepts are being considered with 8% p.a. discrete compunding as the criterion. A rock turnal of indefinitely long life will cost Rs. 30 Lakhs now, and will need Rs. 60,000 per year for operations. The alternative is by a pipe line system, with an expected life of 20 years, at a first cost of Rs. 20 Lakhs now, and will need annual operating expenses of Rs. 92,000. In term of annualized costs, the turnel system will have a relative disadvantage of _____.

(Given C.R.F at 8% p.a., discrete compounding for 20 years = 0.10185)

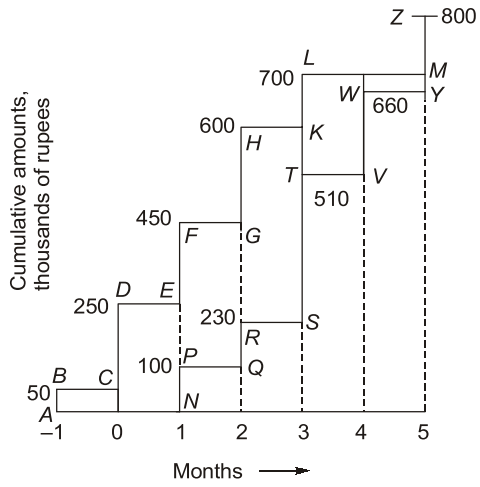
Q.23 Consider the following statements regarding the slope of cost-time curve:

1. It is given by difference between normal cost and crash cost divided by crash time.
2. It is given by difference between crash cost and normal cost divided by difference between crash time and normal time.
3. It is given by difference of crash cost and normal cost divided by normal time.
4. It is given by crash cost divided by crash time.

Which of these statements is/are correct?

(a) 1 only (b) 2 and 3
(c) 2 only (d) 3 and 4

Q.24



In a project of notional 4 months duration, the cumulative outgo and cumulative receipt of a contractor are shown. Outgo is through ABCDEFGHKLM and receipt is through NPQRSTVWYZ. Amounts are in thousands of rupees-cumulative, as indicated. What is the working capital required?

(a) 700
(b) [50 + 250 + 450 + 600 + 700] ÷ 5
(c) [50 + 250 + 150 + 220 + 90 + 40] ÷ 6
(d) 370

Q.25 The probability that the load on a scattolding will exceed the design load of 3 tonne is 0.15. At the same time, the probability that the strength of the scattolding will be more than 3 tonnes is 0.85. Then the probability that the scattolding will fail is_____.

■■■■

Answers Crashing of Network and Engineering Economy

1. (a)	2. (b)	3. (a)	4. 7700	5. (b)	6. (a)	7 (a)	8. (c)	9. (d)	10. (a)
11. (d)	12. (a)	13. (d)	14. (c)	15. (c)	16. (b)	17. (d)	18. (b)	19. (a)	20. (a)
21. 210	22. 4300	23. (c)	24. (d)	25. 0.0225					

Explanations Crashing of Network and Engineering Economy

1. (a)

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

3. (a)

$$\text{Sinking fund factor} = \frac{i}{(1+i)^n - 1}$$

$$= \frac{0.05}{(1+0.05)^4 - 1} = 0.232$$

4. 7700 (7699 to 7701)

$$\text{Cost slope} = \frac{8500 - 6500}{10 - 5} = 400$$

For duration of 7 days,

Direct cost = 6500 + 400 (10 – 7)
= 6500 + 1200 = Rs. 7700

5. (b)

Given,
Normal cost (c_n) = Rs. 350

Normal time (t_n) = 10 days
Crash time (t_c) = 8 days
Let the crash cost be x rupees then cost slope

$$= \frac{C_c - C_n}{t_n - t_c}$$

$$75 \Rightarrow \frac{x - 350}{10 - 8}$$

i.e. $x = 75 \times 2 + 350$

$x = 500$ Rupees

Hence option 'b' is correct.

6. (a)

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

7 (a)

The minimum cost for normal duration of all activities = 800 + 1200 + 500 = 2500 units.
The maximum cost for crash duration of all activities = 1000 + 1500 + 900 = 3400 units.

8. (c)

The average cost of equipment is given by

$$P_{av} = \frac{P(n+1) + S(n-1)}{2n}$$

Here $P = 40000;\ n = 8;\ S = 0$

$$\therefore \quad P_{av} = \frac{40000 \times 9}{16} = 22500$$

Annual depreciation

$$= \frac{40000}{8} = 5000$$

$\therefore$ Total annual cost

$$= 0.15 \times P_{av} + 5000 = 8375$$

9. (d)

Fixed indirect cost is independent of the progress of project. It includes initial expenditure for purchase of equipment, installation and storage charge required for different activities.

10. (a)

The inventory procurement cost = $\frac{DF}{Q}$

The carrying cost = $\frac{QC}{2}$

Total cost = $\frac{DF}{Q} + \frac{QC}{2}$

Where, $D \rightarrow$ Demand in units per year.
$Q \rightarrow$ Order quantity
$C \rightarrow$ Carrying or holding cost (per unit per year)
$F \rightarrow$ Fixed order cost

For minimum total cost,

$$\frac{DF}{Q} = \frac{QC}{2}$$

$\therefore$ Economic Order Quantity (EOQ)

$$Q = \sqrt{\frac{2DF}{C}}$$

11. (d)

Here, statement I is incorrect, $\because$ by crashing we aim to decrease out total cost so, option 'd' is correct.

12. (a)

The duration through which an investment may be recovered.
Payback period

$$= \frac{\text{Amount to be invested}}{\text{Estimated annual net cash flow}}$$

Payback period is the time required to earn back the amount invested in an asset from its net cash flows. It is a simple way to evaluate the risk associated with a proposed project. An investment with shorter payback period is considered to be better, since the investor's initial outlay is at risk for shorter period of time.

13. (d)

2 and 3 are correct.

14. (c)

Capital recovery factor,

$$\text{CRF} = \frac{i(1+i)^n}{(1+i)^n - 1}$$