Course No: CE G527   **Date: 03-11-2022 [4:00 PM start]**
Duration: 90 Mins (Closed book)   **Max. Marks: 70**

I: Choose the best answers   **[10 x 1 = 10 marks]**

1. If the critical paths are such that no activities are common in them, then these are termed as independent critical paths (True/False)
2. Crashing the non-critical activities of the project is not useful as it is going to increase only the expense (True/False)
3. In PERT, standard deviation and variance are not affected by the most likely time estimate (True/False)
4. The start buffer and end buffer relationship between two activities depend strongly on the pace of those two activities (True/False).
5. VED stands for _____ in materials inventory management.
6. The equipment which is preferably used at hard-reach locations is _____
7. The expression for CPI is _____
8. In crashing the network, the critical path will never be altered irrespective of how many activities are crashed (True/False).
9. For locally available materials, ordering cost is much higher (True/False)
10. Crawler excavators are generally slower than the wheeled excavators and is very good for uneven terrain (True/False)

II: Short answers   **[10 x 3 = 30]**

1) What is the advantage of double declining method over the straight line depreciation?

2) Define indirect cost and give an example of indirect cost.

3) Following is the list of activities in a typical network.

Activity	Normal time (days)	Normal cost (Rs.)	Crash time (days)	Crash cost (Rs.)
1-2	4	3,500	3	4,000
1-3	5	14,500	3	16,200
2-3	7	22,000	5	24,000
2-4	11	11,200	7	16,000
3-4	9	4,000	5	9,600

Determine the following:
1) Critical path and its duration
2) If the duration is to be reduced by one day, which activity needs to be crashed first?

4) Is it possible to get "unfavorable material usage variance" and "favorable material price variance"?

5) Explain with an example the importance of free float.

6) Explain the importance of lead time in inventory management.

7) Why reduction in indirect costs is highly beneficial in many cases?

8) What are the factors affecting the selection of a particular equipment? Is it advantageous to get the equipment on rental basis?

9) What is meant by work break down structure? How do you decide the limit below which it is no longer necessary to split further?

10) Consider a task involving 160 sq.m. of fixing timber formwork for the roof slab of single-storey RCC building. The time earmarked for completion is four days working for eight hours per day. If a workers' team consisting of two skilled workers and an unskilled worker can install the formwork at the rate of 1.50 m^2/hour, determine the team-hours required and number of workers required.

III: Long answers: [30 marks]

1) Consider a project having duration of 21 weeks and the normal direct cost of all activities of Rs. 5, 50,000. The crash duration considering the nature of the project is limited to 15 weeks.

Indirect cost can be taken as Rs. 10000 per day. It was agreed that the project is to be completed in 18 weeks beyond which penalty needs to be paid by the contractor at the rate of 50,000/week. Draw direct cost vs time curve and find out the minimum project cost and the corresponding duration.

Duration (in weeks)	Direct cost (jn Rs.)
15	9,50,000
16	7,25,000
17	7,00,000
18	6,75,000
19	6,25,000
20	6,00,000
21	5,50,000

2) The earth moving equipment is purchased at a cost of Rs. 10 Lakhs. The income generated and cost outflow for five years are given below. The salvage value is estimated to be nil.

Year	1	2	3	4	5
Gross income (in lakhs)	4	4	2	2	2
Expenses (in lakhs)	0.5	0.5	1	0.5	0.5

A tax rate of 20% is applicable to both income and gains and is not excepted to change in 5 years. A discount rate of 8% is appropriate considering the return on investment. Determine a) Annual depreciation by straight line method; b) Annual depreciation by Double declining balance method; c) Considering only the DDB (switchover to straight line for the remaining tax life is permitted if tax benefits possible), determine the Net-cash flow before tax, after-tax cash flow and NPV.

3) Consider the data reported below at the end of the 30th week of the Hospital Building project (10 storeyed), which is scheduled for completion at the end of 60th week. Determine the earned value, planned value and CPI. Assuming that the remaining work shall progress at prevailing trend, determine the cost forecast at completion.

Name of the activity	Planned progress (%)	Actual progress (%)	BAC (in lakhs)	ACWP (in lakhs)
Completion of structural design & drawings	100	100	10	12
Identification of contractors	100	95	5	3
Site excavation	100	100	25	30
Construction of all storeys (including basement)	70	60	150	90
Installation of all equipments including fire extinguishers	50	40	75	30
Special finish of all flooring in line with hospital requirements	40	15	40	8
Installation and commissioning of elevators	40	20	20	5
Finalization of electricity supply	20	15	5	0.5