MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

V SEMESTER B. TECH (CIVIL) END SEMESTER EXAMINATIONS

NOVEMBER 2023

SUBJECT: CONSTRUCTION MANAGEMENT [CIE 3153]

Date of Exam: **/11/2023** Time of Exam: – am/pm Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions & missing data may be suitably assumed

<table>
<tr><th>Q. No</th><th>Questions</th><th>Marks</th><th>CO</th><th>BL</th></tr>
<tr><td>1A</td><td>Illustrate the significance of WBS by creating one for a G+1 commercial complex project.</td><td>2</td><td>1</td><td>3</td></tr>
<tr><td>1B</td><td>Schedule the following activities using a bar chart and determine the project duration.
<table>
<tr><th>Activity ID</th><th>Activity description</th><th>Immediate predecessor</th><th>Duration (days)</th></tr>
<tr><td>A</td><td>Prepare site layout</td><td>-</td><td>1</td></tr>
<tr><td>B</td><td>Construct foundation</td><td>A</td><td>5</td></tr>
<tr><td>C</td><td>Backfilling</td><td>B</td><td>1</td></tr>
<tr><td>D</td><td>Build superstructure wall</td><td>C</td><td>8</td></tr>
<tr><td>E</td><td>Construct roof slab</td><td>D</td><td>2</td></tr>
<tr><td>F</td><td>Pond curing</td><td>E</td><td>1</td></tr>
<tr><td>G</td><td>Build compound wall</td><td>C</td><td>8</td></tr>
<tr><td>H</td><td>Exterior superstructure wall plastering</td><td>F</td><td>7</td></tr>
<tr><td>I</td><td>Interior superstructure wall & slab plastering</td><td>H</td><td>9</td></tr>
</table></td><td>4</td><td>2</td><td>3</td></tr>
<tr><td>1C</td><td>Draw a neat network diagram for the activity interdependencies in the table and logically number the events.
<table>
<tr><th>Activity</th><th>Immediate predecessor</th><th>Activity</th><th>Immediate predecessor</th></tr>
<tr><td>A</td><td>-</td><td>F</td><td>D, E</td></tr>
<tr><td>B</td><td>-</td><td>G</td><td>C, D</td></tr>
<tr><td>C</td><td>A</td><td>H</td><td>C</td></tr>
<tr><td>D</td><td>A, B</td><td>I</td><td>F, G, H</td></tr>
<tr><td>E</td><td>B</td><td></td><td></td></tr>
</table></td><td>4</td><td>2</td><td>3</td></tr>
<tr><td>2A</td><td>Illustrate the characteristics of Beta distribution with a neat sketch.</td><td>2</td><td>3</td><td>2</td></tr>
</table>

2B Draw a neat A-O-A network for the activity schedule in the table. Determine total, free, independent, and interfering floats using a tabular approach. Mark critical activities.

Activity	Immediate predecessor	Duration (days)	Activity	Immediate predecessor	Duration (days)
A	-	4	E	B	4
B	-	9	F	B, C	4
C	A	6	G	D	8
D	A	4	H	E, F, G	4

5 | 3 | 3

2C Explain how the concept of 'Probability' is applied in determining the completion time of a project using PERT scheduling. **3 | 2 | 3**

3A Compare the probabilistic and deterministic approaches in scheduling. **2 | 3 | 2**

3B With suitable illustration, explain i) the total cost curve and ii) the significance of cost slope in time-cost optimization. **3 | 4 | 3**

3C Assuming the indirect cost at ₹ 1,000 per day, work out the optimum duration and minimum cost of the project, the details of which are presented in the table below.

Activity	Immediate predecessor	Cost (₹)		Duration (days)	
		Normal	Crash	Normal	Crash
A	-	5000	6400	7	5
B	A	5500	6400	6	5
C	A	8000	9350	8	5
D	B	12000	14400	10	7
E	C	6000	7000	6	4
F	C	5000	5900	4	3
G	D, F	7000	10000	4	2
H	G, E	6500	9500	7	4

5 | 4 | 3

4A Draw the network for the following project activities and determine the original critical path.

Activity	Immediate predecessor	Duration (days)	Activity	Immediate predecessor	Duration (days)
A	-	6	E	B	8
B	-	2	F	C, D	6
C	A	8	G	E	5
D	b	5	H	F, G	2

At the end of the 10th day, the following updates are received from the site:

Activities A and B are completed as planned.

Activity C and D are in progress and require 5 and 4 more days to

4

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	complete. Activity E and F are yet to begin, but they now require 5 days each to complete. Activity G and H will go on as per the original estimates. Draw an updated project network and comment on the changes observed compared to the original network.			
4B	Explain the bathtub concept of equipment maintenance.	**3**	**5**	**2**
4C	Explain any three factors that govern the selection of equipment.	**3**	**5**	**2**
5A	A construction company purchases equipment for ₹ 5,55,000. The expected service life 7 years and will be used 1,600 hours per year. The salvage value at the end of service life is estimated at 10% of the principal cost. Calculate i) the ownership cost per hour of the equipment using the straight-line method for depreciation and the average annual investment method if the investment cost is 12% of the average annual investment cost. ii) operating cost for the following details: crankcase capacity- 40 liters, service interval- 100 hours, rated power- 250 hp, power factor- 0.7. Take 15% charges for transportation, insurance, and handling, while the risk factor is estimated at 6%, fuel cost @ ₹ 90 per litre, lubricating oil @ ₹ 400 per litre.	**4**	**5**	**3**
5B	Compare scraper and power shovel on i) basic parts and operation ii) suitability of application, and iii) practical limitations.	**3**	**5**	**2**
5C	List the most common hoisting equipment used in large construction projects. Draw a schematic representation of a tower crane. Label and explain the operation of parts of the tower crane.	**3**	**5**	**3**