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P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belgaum)
First Semester, M. Tech - Civil Engineering (MCAD)
Semester End Examination; Jan/Feb - 2016
Construction Project Management and Structural Optimization

Time: 3 hrs   *Max. Marks: 100*

*Note: i) Answer **FIVE** full questions, selecting **ONE** full question from each **unit**.*
  ii) Any missing data may be suitably assumed.

UNIT - I

1 a. What is bar chart? What are the short comings of bar charts? How are these removed?   10

  b. Explain Work break down structure. Prepare the Work break down structure for house construction project.   10

2. a. Explain the terms :
   i) Project planning   ii) Project scheduling   iii) Project controlling.   10

  b. Explain the terms :
   i) Job layout   ii) Bar chart   iii) Work break down structure.   10

UNIT - II

3. A project has the following time schedule :

Activity	Time in Weeks	Activity	Time in Weeks
1 - 2	4	5 - 7	8
1 - 3	1	6 - 8	1
2 - 4	1	7 - 8	2
3 - 4	1	8 - 9	1
3 - 5	6	8 - 10	8
4 - 9	5	9 - 10	7
5 - 6	4		

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Construct PERT network and compute :

i) (T_E) EARLIEST TIME and (T_L) LATEST TIME for each event.

ii) Float for each activity

iii) Critical path and its duration

4. A project has the following time schedule :

Activity	Time in Months	Activity	Time in Months
1-2	2	4-6	3
1-3	2	5-8	1
1-4	1	6-9	5
2-5	4	7-8	4
3-6	8	8-9	3
3-7	5		

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i) Construct PERT network.

ii) Compute Total Float for each activity.

iii) Critical path and its duration.

Also find the minimum number of cranes the project must have for its activities 2 - 5, 3 - 7 and 8 - 9 without delaying the project. Then, is there any change required in PERT Network? If so indicate the same.

UNIT - III

5. The following data pertains to a CPM network :

ACTIVITY	NORMAL		CRASH	
	Time (Weeks)	Cost (Rs)	Time (Weeks)	Cost (Rs)
1 - 2	8	7000	3	10,000
1 - 3	4	6000	2	8,000
2 - 3	0	0	0	0
2 - 5	6	9000	1	11,500
3 - 4	7	2500	5	3,000
4 - 6	12	10,000	8	16,000
5 - 6	15	12,000	10	16,000
5 - 7	7	12,000	6	14,000
6 - 8	5	10,000	5	10,000
7 - 8	14	6,000	7	7,400
7 - 9	8	6,000	5	12,000
8 - 9	6	6,000	4	7,800

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The project indirect cost is 1000/week.

i) Draw the network for the project.

ii) What is the normal project length and normal project cost.

iii) Find the optimum duration and minimum project cost.

iv) If all the activities are crashed, what will be the project duration and corresponding cost?

6. Table below shows, jobs, their normal time and cost and crash time and cost for a project :

JOB	NORMAL		CRASH	
	Time (days)	Cost (Rs)	Time (days)	Cost (Rs)
1 - 2	6	1400	4	1900
1 - 3	8	2000	5	2800
2 - 3	4	1100	2	1500
2 - 4	3	800	2	1400
3- 4	0	0	0	0
3 - 5	6	900	3	1600
4 - 6	10	2500	6	3500
5 - 6	3	500	2	800

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Indirect cost for the project is Rs. 300 per day.

i) Draw the network of the project

ii) What is the normal duration cost?

iii) If all the activities are crashed, what will be the project duration and corresponding cost?

iv) Find the optimum duration and minimum project cost.

UNIT - IV

7 a. Obtain the set of necessary conditions for the non-linear programming problem :

Maximise $Z = X_1^2 + 3X_2^2 + 5X_3^2,$

subject to the constraints :   10

$X_1 + X_2 + 3X_3 = 2$

$5X_1 + 2X_2 + X_3 = 5$

$X_1, X_2, X_3 \geq 0.$

b. State and prove Kuhn - Tucker necessary condition in non linear programming.   10

8 a. State and prove Kuhn - Tucker sufficient conditions in non linear programming.   10

b. State fire engineering applications of optimization.   5

c. Write a note on various methods of solving linear programming problems.   5

UNIT - V

9. Use simplex method to solve the LPP,

Maximise $Z = 3X_1 + 2X_2$

subject to :   20

$X_1 + X_2 \leq 4$

$X_1 - X_2 \leq 2$ *and* $X_1, X_2 \geq 0.$

10. Solve the following LPP by simplex method,

$Z_{min} = X_1 - 3X_2 + 2X_3$

subject to :   20

$3X_1 - X_2 + 2X_3 \leq 7$

$-2X_1 + 4X_2 \leq 12$

$-4X_1 + 3X_2 + 8X_3 \leq 10.$

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