



**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 - 2017**

**Consumer Project Management and Structure Optimization**

*Time: 3 hrs*

*Max. Marks: 100*

*Note: i) Answer FIVE full questions, selecting ONE full question from each unit.  
ii) Assume missing data, if any.*

**UNIT - I**

- 1 a. Explain the three phases of any project. 10
- b. What do you mean by a decision? What are the steps in rational decisions making? 10
- 2 a. Define organization. What are the important principles of organization? 10
- b. What are the objectives of any project management technique? 4
- c. What are the advantages and disadvantages of Bar chart? 6

**UNIT - II**

- 3 a. State the difference between PERT and CPM. 6
- b. A project has the following time schedule,

Activity	1-2	1-3	1-4	2-5	3-6	3-7	4-6	5-8	6-9	7-8	8-9
Duration (Months)	2	2	1	4	8	5	3	1	5	4	3

Construct CPM network and compute :

- i) Total float, Free float and Independent float for each activity 14
- ii) Critical path and in duration
- iii) Find the minimum number of cranes the project must have for in activities (2-5), (3-7) and (8-9) without delaying the project. Then, is there any change required in network, if so indicate the same.
- 4 a. A small project is composed of activities whose time estimates are listed in the Table-(1). Activities are identified by their beginning (i) and ending (j) node members.

Table - (1)

Activity (i - j)	Estimated decision (weeks)		
	Optimistic	Most likely	Pessimistic
1 - 2	1	1	7
1 - 3	1	4	7
1 - 4	2	2	8
2 - 5	1	1	1
3 - 5	2	5	14
4 - 6	2	5	8
5 - 6	3	6	15

16

- i) Draw the Project Network
- ii) Find the expected duration and variance for each activity. What is the project length?
- iii) Calculate the variance and standard deviation of the project length. What is the probability that the project will be completed at least 4 weeks earlier than expected?
- iv) If the project is due in 19 weeks, what is the probability of meeting the due date?

Given :

Z	0.5	0.67	1.00	1.33	2.0
P	0.1915	0.2486	0.3413	0.4082	0.4772

- b. Define Total float and Tree float. 4

**UNIT - III**

- 5 a. What do you mean by resource smoothing and resource leveling? Explain with a neat sketch. 8
- b. A CPM network consists of the following Activities :

Activity	i Node j	Duration		Time cost curve slope Rs./day
		Normal	Crash	
A	1 - 3	7	3	50
B	1 - 2	9	7	30
C	3 - 5	4	1	75
D	2 - 5	5	3	125
E	2 - 4	3	1	10
F	5 - 6	6	4	166
G	4 - 6	2	1	500

Find:

- i) Critical path
- ii) If all normal conditions exist, total cost of all the project activities is ` 5,500.00. Indirect cost is ` 150 per day. Calculate all possible schedule and their total cost.
- iii) Which is the most economical Project Duration?
- 6 a. Explain the time-cost relationship through a diagram. 8
- b. What are the situations one should consider updating the network and what are the information required for updating a network? 8
- c. What do you mean by resource leveling? 4

**UNIT - IV**

- 7 a. State and Prove Kohn-Tucker necessary condition in non-linear programming. 10
- b. Explain the procedure for finding the saddle point in case of single variable optimization. 5
- c. Find the extreme points of  $y = x^3 - 12x$ . 5

- 8 a. Obtain the necessary and sufficient conditions for the optimum solution of the following :

$$\text{Minimize } Z = 3e^{2x_1+1} + 2e^{x_2+5}$$

10

$$\text{Subject to } y = x_1 + x_2 = 7, \quad x_1, x_2 \geq 0.$$

- b. Solve the non-linear programming problem. Optimise  $Z = 4x_1^2 + 2x_2^2 + x_3^3 - 4x_1x_2$  subject to the constraints  $x_1 + x_2 + x_3 = 15$ ,  $2x_1 - x_2 + 2x_3 = 20$ .

10

### UNIT - V

9. Use simplex method to solve LPP,

$$\text{Maximize } Z = 4x_1 + 10x_2$$

$$\text{Subject to } 2x_1 + x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

$$x_1, x_2 \geq 0.$$

20

10. Use revised simplex method to solve LPP,

$$\text{Maximize } Z = 6x_1 - 2x_2 + 3x_3$$

$$\text{Subject to } 2x_1 - x_2 + 2x_3 \leq 2$$

$$x_1 + 4x_3 \leq 4$$

$$x_1, x_2, x_3 \geq 0.$$

20

\* \* \*