

C 3135

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Sixth Semester

Computer Science and Engineering

CS 1001 — RESOURCE MANAGEMENT TECHNIQUES

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

(Use of Statistical Tables permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the limitations of LPP?
2. What is the objective of sensitivity analysis?
3. How dual simplex method differs from that of regular simplex method?
4. Give the mathematical formulation of assignment problem.
5. What is the importance of integer programming problem?
6. State Bellman's Principle of Optimality in dual programming.
7. State Kuhn-Tucker necessary and sufficient conditions.
8. What is meant by Lagrange's Multipliers method?
9. What are the applications of PERT/CPM techniques?
10. Define resource leveling.

PART B — (5 × 16 = 80 marks)

11. (a) An animal feed company must produce 200 kgs of a mixture consisting of ingredient X_1 and X_2 daily. X_1 costs Rs. 3 per kg and X_2 costs Rs. 8 per kg. No more than 80 kgs of X_1 can be used and at least 60 kgs of X_2 must be used. Find how much of each ingredient should be used if the company wants to minimize the cost.

Or

(b) Given the linear programming problem :

$$\text{Maximize } Z = 3x_1 + 5x_2$$

Subject to the constraints

$$3x_1 + 2x_2 \leq 18$$

$$x_1 \leq 4$$

$$x_2 \leq 6$$

$$x_1, x_2 \geq 0.$$

12. (a) Use dual simplex method to solve

$$\text{Minimize } Z = 3x_1 + x_2$$

Subject to the constraints

$$x_1 + x_2 \geq 1$$

$$2x_1 + 3x_2 \geq 4$$

$$x_1, x_2 \geq 0.$$

Or

(b) The following table gives the cost of transporting material from supply points A, B, C and D to demand points E, F, G, H and J.

		To				
		E	F	G	H	J
From	A	8	10	12	17	15
	B	15	13	18	11	9
	C	14	20	6	10	13
	D	13	19	7	5	12

The present allocation is as follows : A to E 90 ; A to F 10 ; B to F 150 ; C to F 10 ; C to G 50 ; C to J 120 ; D to H 210 ; D to J 70. Check if this allocation is optimum. If not, find an optimum schedule.

13. (a) Maximize $Z = x_1 + 2x_2$

Subject to the constraints

$$2x_2 \leq 7$$

$$x_1 + x_2 \leq 7$$

$$2x_1 \leq 11$$

$$x_1, x_2 \geq 0 \text{ and integers.}$$

Or

- (b) A student has to take examination in three courses X, Y and Z. He has three days available for study. He feels it would be best to devote a whole day to the study of the same course, so that he may study a course for one day, two days or three days or not at all. His estimates of grades he may get by study are as follows :

		Course		
		X	Y	Z
Study days	0	1	2	1
	1	2	2	2
	2	2	4	4
	3	4	5	4

How should he plan to study so that he maximizes the sum of his grades?

14. (a) Solve the non-linear programming problem :

$$\text{Optimize } Z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$$

Subject to the constraints :

$$\begin{aligned} x_1 + x_2 + x_3 &= 15 \\ 2x_1 - x_2 + 2x_3 &= 20 \\ x_1, x_2, x_3 &\geq 0. \end{aligned}$$

Or

- (b) Use Kuhn-Tucker condition to

Determine x_1, x_2, x_3 so as to

$$\text{Maximize } Z = x_1^2 - x_2^2 - x_3^2 + 4x_1 + 6x_2$$

Subject to the constraints

$$\begin{aligned} x_1 + x_2 &\leq 2 \\ 2x_1 + 3x_2 &\leq 12 \\ x_1, x_2 &\geq 0. \end{aligned}$$

15. (a) A project has the following characteristics :

Activity	Optimistic time	Most likely time	Pessimistic time
1 - 2	1	1.5	5
2 - 3	1	2	3
2 - 4	1	3	5
3 - 5	3	4	5
4 - 5	2	3	4
4 - 6	3	5	7
5 - 7	4	5	6
6 - 7	6	7	8
7 - 8	2	4	6
7 - 9	5	6	8
8 - 10	1	2	3
9 - 10	3	5	7

Construct a PERT network. Find the critical path and variance for each event. Find the project duration at 95% probability.

Or

(b) A problem of project scheduling is shown below :

Activity	1 - 2	1 - 3	1 - 4	2 - 4	2 - 5	3 - 5	4 - 6	5 - 6
Duration (weeks)	8	6	8	12	4	4	10	10
Manpower requirement	7	13	9	11	6	3	15	3

Obtain a schedule which will minimize the peak manpower requirement and also smooth out period-to-period variation of manpower requirement.