Reg. No. : | | | | | | | | | | | |

S 4910

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Seventh Semester

Information Technology

CS 1001 — RESOURCE MANAGEMENT TECHNIQUES

(Regulation 2004)

Time : Three hours Maximum : 100 marks

(Use of statistical tables permitted)

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Does an LP problem always have a feasible solution. Give reason.

2. State the objective of sensitivity analysis.

3. Write any two of the primal-dual problems relationships.

4. Determine an optimum schedule for the following assignment problem.

	1	2	3
A	10	8	12
B	18	6	14
C	6	4	2

5. Define integer programming problem and specify its importance.

6. State the principle of optimality in dynamic programming and give a mathematical formulation.

7. How are following terms used in the process of getting optimal solution?

   (a) gradient of a function

   (b) stationary point of a function.

8. State Kuhn-Tucker necessary and sufficient conditions.

9. What are the different techniques of network scheduling? Distinguish.

10. What is meant by "crashing" in network techniques?

PART B — ($5 \times 16 = 80$ marks)

11. (a) A feed company uses atleast 800 kg of special feed daily. The special feed is a mixture of corn and soybean meal with the following compositions.

Feed stuff	kg per kg of feed stuff		
	Protein	Fiber	Cost (Rs/kg)
Corn	0.09	0.02	12.00
Soybean meal	0.60	0.06	36.00

The dietry requirements of the special feed are atleast 30% protein and at most 5% fiber. Determine the daily minimum-cost feed mix.

Or

(b) Solve the following linear programming problem using simplex method.

Maximise $Z = 6x_1 + 4x_2$

Subject to the constraints

$$2x_1 + 3x_2 \leq 30$$
$$3x_1 + 2x_2 \leq 24$$
$$x_1 + x_2 \geq 3$$
$$x_1, x_2 \geq 0.$$

Is the solution unique? If not give all possible solutions.

12. (a) Use dual simplex method to solve the following LPP

Minimize $Z = 6x_1 + 7x_2 + 3x_3 + 5x_4$

Subject to

$$\begin{aligned} 5x_1 + 6x_2 - 3x_3 + 4x_4 &\geq 12 \\ x_2 + 5x_3 - 6x_4 &\geq 10 \\ 2x_1 + 5x_2 + x_3 + x_4 &\geq 8 \\ x_1, x_2, x_3, x_4 &\geq 0 \end{aligned}$$

Or

(b) A company has one surplus truck in each of the cities A, B, C, D and E and one deficit truck in each of the cities 1, 2, 3, 4, 5 and 6. The distance between the cities in kilometers is shown the matrix below. Find the assignment of trucks from cities in surplus to cities in deficit so that the total distance covered by the vehicles is minimum.

	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

13. (a) Solve the following problem by the fractional cut and compare the true optimum integer solution with the solution obtained by rounding the continuous optimum.

Maximize $Z = 3x_1 + x_2 + 3x_3$

Subject to

$$\begin{aligned} -x_1 + 2x_2 + x_3 &\leq 4 \\ 4x_2 - 3x_3 &\leq 2 \\ x_1 - 3x_2 + 2x_3 &\leq 3 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

and integer

Or

(b) Seven units of capital can be invested in four activities with the return from each activity given in the following table. Find the allocation of capital to each activity that will maximise the total return.

	g^1 (Q)	g^2(Q)	g^3(Q)	g^4(Q)
0	0	0	0	0
1	2	3	2	1
2	4	5	3	3
3	6	7	4	5
4	7	9	5	6
5	8	10	5	7
6	9	11	5	8
7	9	12	8	8

14. (a) Solve the following non-linear programming problem, using the method of Lagrangian multipliers.

Minimize $Z = x_1^2 + x_2^2 + x_3^2$ subject to the constraints.

$x_1 + x_2 + 3x_3 = 2, 5x_1 + 2x_2 + x_3 = 5, x_1, x_2, x_3 \geq 0$

Or

(b) Use the Kuhn-Tucker conditions to solve the following non-linear programming problem.

Maximize $Z = 8x_1 + 10x_2 - x_1^2 - x_2^2$ subject to constraints $3x_1 + 2x_2 \leq 6; x_1 \geq 0; x_2 \geq 0$

15. (a) A small project composed of seven activities whose time estimates are listed in the following table :

Activity		Estimated Duration (Weeks)		
i	j	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

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

Or

(b) The activities of a project and the labour requirements in respect thereof are :

Activity	Time	Workers
1-2	6	6
1-3	6	18
1-4	21	7
2-5	3	10

Activity	Time	Workers
3-5	7	15
3-2	3	3
4-7	5	8
5-7	7	16
6-7	4	9

How should the activities be scheduled if it is desired to smoothen the labour employment on the project as far as possible? What is the labour requirement?
