ROLL NO. _____

Code: CS42 Subject: OPERATIONS RESEARCH AND SYSTEM SIMULATION

ALCCS - OLD SCHEME

Time: 3 Hours **FEBRUARY 2012** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:

- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**
- **All calculations should be up to three places of decimals.**

Q.1 a. Discuss the 'implementation stage' of a O.R. model.

b. Define Linear Programming Problem and express it in its standard form.

c. Explain the 'properties of basic solution' of linear programming problems.

d. What is Dynamic Programming? Explain the features of Dynamic Programming problems.

e. What is (i) mixed integer programming problem and (ii) zero-one programming problems. Also write the general mathematical form of Integer programming problems.

f. Discuss 'degeneracy' and 'cycling' in LPP.

g. Distinguish between Simulation and Monte Carlo Method. **(7 × 4)**

Q.2 a. Explain the graphical method of solving LPP. **(5)**

b. Solve the following LP problem using simplex Method

$$\text{Maximize } Z = 10X_1 + 15X_2 + 20X_3$$

$$\text{Subject to } 2X_1 + 4X_2 + 6X_3 \leq 24$$

$$3X_1 + 9X_2 + 6X_3 \leq 30$$

$$X_1, X_2, X_3 \geq 0$$ **(13)**

Q.3 a. Define
(i) Feasible solution
(ii) Basic feasible solution
in transportation problems. **(6)**

b. Consider the following transportation problem involving three resources and four destinations as shown below. The cell entries represent the cost of transportation per unit.

		Destination				
		1	2	3	4	Supply
Source	1	*3*	*1*	*7*	*4*	*300*
	2	*2*	*6*	*5*	*9*	*400*
	3	*8*	*3*	*3*	*2*	*500*
Demand		*250*	*350*	*400*	*200*	

Obtain the initial basic feasible solution using the Vogel's Approximation Method **(12)**

Q.4 a. Brief the need of sensitivity analysis for linear programming. **(4)**

b. A heating and air-conditioning distributor must make quarterly purchasing decisions for a special type of compressor. At the beginning of each month, the company must purchase enough compressors to satisfy demand. Excess purchases are carried over as inventory for the next month. The company has zero units on hand on 1st October and wants no inventory after December. The data on compressor demand, purchase price and inventory holding cost are given in the table below:

Month	Demand	Price ($)	Inventory cost ($/unit/month)
October	3	150	12
November	4	160	10
December	2	175	10

Calculate the optimal decision for each possible values of state variable. Use backward computational procedure for this Dynamic Programming problem. **(14)**

Q.5 a. Explain the step by step procedure for solving a Mixed Integer Programming problem using Branch-and-Bound Algorithm. **(9)**

b. A departmental head has four subordinates, and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in there intrinsic difficulty. His estimate of the time each man would take to perform each task is given below:

Task / Men	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

Solve this as an assignment problem **(9)**

Q.6 a. What is deterministic dynamic programming? Explain. **(6)**

b. Draw the following GPSS block types and write the descriptive of the block action.
   (i) TERMINATE
   (ii) TRANSFER
   (iii) ADVANCE **(4×3)**

Q.7 a. What are the features to be considered while building a simulation model? Explain basic steps needed to make a simulation study. **(12)**

b. A machine tool in a manufacturing shop is turning out parts at the rate of every 5 minutes. As they are finished, the parts are turned over to an inspector who takes 4 ± 3 minutes to examine each one and rejects about 10% of the parts as faulty. Each part will be represented by an Xact and the base time unit for the system is chosen as 1 minute. Simulate for 100 parts to leave the system. **(6)**