ROLL NO. _____

Code: CS42 Subject: OPERATIONS RESEARCH AND SYSTEM SIMULATION

ALCCS - OLD SCHEME

Time: 3 Hours **AUGUST 2013** **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. What a researcher do with Simulation? What are the merits and constraints of simulation during application?

b. State and explain the various application areas of Operation Research.

c. Explain the methodology to establish experimental conditions for runs while designing a simulation experiment? Explain.

d. Explain the basic elements and structure of a Linear Program formulation.

e. Name and explain the most widely used method for solving assignment problems.

f. Explain how dual simplex method is used for solving LPP.

g. Define 'exogenous' and 'endogenous' variables used in simulation. List the exogenous and endogenous variables that can be identified and characterized while simulating a single server queue. **(7 × 4)**

Q.2 a. Explain the concept of cycling and degeneracy in linear programming problems. **(4)**

b. Solve the following LPP by graphical method

Minimize $Z = 20\,X_1 + 40\,X_2$

Subject to constraints

$36\,X_1 + 6\,X_2 \geq 108$

$3\,X_1 + 12\,X_2 \geq 36$

$20\,X_1 + 10\,X_2 \geq 100$

$X_1,\ X_2 \geq 0$ **(14)**

Q.3 a. Write the Dual of the following LPP

Minimize $Z = 4\,X_1 + 5\,X_2 - 3\,X_3$

Subject to constraints :

$X_1 + X_2 + X_3 = 22$

$3X_1 + 5X_2 - 2X_3 \leq 65$

$X_1 + 7X_2 + 4X_3 \geq 120$

$X_1, X_2 \geq 0$ and X_3 is unrestricted **(6)**

b. The following table gives the machining times in hours for five machines for performing five jobs. Each machine can be assigned to only one machine. Solve this as an assignment problem with an objective to minimize the total time. **(12)**

	J1	J2	J3	J4	J5
M1	7	5	9	8	11
M2	9	12	7	11	10
M3	8	5	4	6	9
M4	7	3	6	9	5
M5	4	6	7	5	11

Q.4 a. Explain the situation where an LPP can be classified as an integer programming problem. **(4)**

b. A retailer has the following month wise demand, price in euro and the inventory cost in euro/unit/month for generators:
Jan: demand=3: Price in euro = 150 and inventory cost in euro/unit/month = 12
Feb: demand=4: Price in euro = 160 and inventory cost in euro/unit/month = 10
Mar: demand=2: Price in euro = 175 and inventory cost in euro/unit/month = 10
Using backward computational procedure for this Dynamic Programming problem, calculate the optimal decision for each possible values of state variable. **(14)**

Q.5 a. A company has three plants supplying the same product to the five distribution centers. Due to peculiarities inherent in the set of cost of manufacturing, the cost / unit will vary from plant to plant. Which is given below. There are restrictions in the monthly capacity of each plant, each distribution center has a specific sales requirement, capacity requirement and the cost of transportation is given below:

Factories	W1	W2	W3	W4	W5	Supply	
F1	5	3	3	6	4	200	
F2	4	5	6	3	7	125	
F3	2	3	5	2	3	175	
Demand	60	80	85	105	70	400	500

The cost of manufacturing a product at the different plants is Fixed cost is Rs. 7×10^5, 4×10^5 and 5×10^5 whereas the variable cost per unit is Rs.13/-, 15/- and 14/- respectively. Determine the quantity to be dispatched from each plant to different distribution centers, satisfying the requirements at minimum cost. **(10)**

b. Explain the following terms:
(i) Initialization
(ii) Branching
(iii) Bounding
(iv) Fathoming with respect to Mixed Integer Programming problem solving algorithm **(8)**

Q.6 a. Explain Monte Carlo Simulation. List the difference between Monte Carlo Method and simulation. **(8)**

b. Explain the issue of 'free or fixed form format' in the generation of GPSS block diagrams. **(10)**

Q.7 a. What makes a problem suitable for simulation modelling and analysis? Explain. **(8)**

b. Solve the following by Simplex method:
Maximize $Z = 80X_1 + 55X_2$
Subject to
$$4X_1 + 2X_2 \leq 40$$
$$2X_1 + 4X_2 \leq 32$$
and $X_1 \geq 0, X_2 \geq 0$ **(10)**