CS-51 Ⓢ

ADCA / MCA (II Year)

Term-End Examination

June, 2007

CS-51 Ⓢ : OPERATIONS RESEARCH

Time : 3 hours *Maximum Marks : 75*

Note : *Question number 1 is* ***compulsory****. Attempt any* ***three*** *more questions from questions numbered 2 to 5.*

1. (a) Are the following statements true or false ?

(i) Two-phase method for solving LPP is used if an initial basic feasible solution is not readily available.

(ii) With ordering quantity as EOQ, ordering cost is equal to holding cost.

(iii) Bellman's Optimality Principle is applied to solve Dynamic Programming problem.

(iv) The number of solution(s) of an LPP is zero or one or infinite.

(v) Kuhn-Tucker conditions are required to be satisfied for proving optimality of a solution in Integer Linear Prgramming problem.

(vi) Relative profit coefficient is computed (in Simplex method for LPP) for the basic variables only to determine the entering variable. 6

(b) Solve the following Non-Linear Programming problem : 6

Minimize $z = x_1^2 + x_2^2$

subject to $x_1 x_2 = 1$

$x_1, x_2 \geq 0.$

(c) Consider an inventory problem with the following data : annual demand for a particular item is 1500 units; rate of carrying cost is 15 paise per unit per year; rate of ordering cost is Rs. 15 per order. Determine (a) economic order quantity, (b) number of orders per year, and (c) minimum total inventory cost per year. 6

(d) Define Operations Research and illustrate two limitations and two applications of OR in the field of computers. 6

(e) Explain the following terms : 6

(i) Deviational variable

(ii) Pre-emptive priority structure

(iii) Cardinal value and Ordinal value

2. (a) Past experience suggests that the probability distribution of number of machine break-downs in a shop is as follows :

No. of break-downs/week	Probability
0	0·01
1	0·25
2	0·56
3	0·15
4	0·03

Simulate the number of break-downs for the next 10 weeks and calculate the average number of break-downs from this data. What is the mean number of break-downs for the above probability distribution ?

[Use the sequence of random digits :
4076486600 8950821628] 7

(b) Solve the following transportation problem and obtain the optimal solution and optimal cost.

	D1	D2	D3	Supply
O1	5	1	0	20
O2	3	2	4	10
O3	7	5	2	15
O4	9	6	0	15
Demand	5	10	15	

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3. (a) The men's department of a large store employs one tailor for customer fittings. The number of customers requiring fittings follows a Poisson distribution with mean arrival rate 24 per hour. Customers are fitted on a first-come, first-served basis, and they are always willing to wait for the tailor's service, because alterations, if any, are free. The time taken to fit a customer appears to be exponentially distributed, with mean of 2 minutes.

(i) What is the average number of customers in the fitting room (system) ?

(ii) How much time should a customer expect to spend in the fitting room ?

(iii) What percentage of the time is the tailor idle ? *8*

(b) Solve the game where payoff matrix is given by

		Player A		
		A_1	A_2	A_3
Player B	B_1	1	3	1
	B_2	0	– 4	– 3
	B_3	1	5	– 1

(i) What is the optimal strategy for player A and player B ?

(ii) What is the value of game ?

(iii) Give nature of game. *7*

4. (a) Find three non-negative real numbers such that the sum of the squares of these is minimum subject to the restriction that their sum is not less than 30.

(i) Formulate this as NLP.

(ii) Formulate also as a Dynamic Programming problem using (i). *8*

(b) Suppose that following constraints have been provided for an LPP :

$$-x_1 + 3x_2 \leq 30$$

$$-3x_1 + x_2 \leq 30$$

$$x_1, x_2 \geq 0$$

(i) Demonstrate graphically that feasible region is unbounded.

(ii) If the objective is to maximize $z = -x_1 + x_2$, does the problem have an optimal solution ? If so, find. If not, explain why not. *7*

5. (a) What is the dynamic recursive relation ? Describe the general process of backward recursion with example. *6*

(b) Four employees are available to perform four given jobs. Each employee must be assigned exactly one job. The time requirement of each job for completion by any employee is given below. It is intended that total time needed to complete the jobs be minimum.

Employee	Time (hours)			
	Job1	Job2	Job3	Job4
1	14	5	8	7
2	2	12	6	5
3	7	8	3	9
4	2	4	6	10

Formulate the problem, and derive optimal solution. *9*