MANAGEMENT PROGRAMME

Term-End Examination
December, 2015

MS-51 : OPERATIONS RESEARCH

Time : 3 hours   *Maximum Marks : 100*
                                    (Weightage 70%)

Note :   (i)   *Attempt **any four** questions.*
          (ii) *All questions carry **equal** marks.*

1. (a) What are the main characteristics of operations research ? Explain with suitable examples. Discuss its scope and limitations.

    (b) What is buffer stock ? List the reasons for keeping a buffer stock : Suppose the lead time for procurement of a product gets doubled, will you recommend doubling its buffer stock ? Justify your answer.

2. (a) Find the initial basic feasible solution of the following transportation problem by Vogetl's approximation method. The availability at the factories, the requirement of the warehouses and the various associated unit transportation cost are presented in the following table :

Factory	Warehouses				Available
	W_1	W_2	W_3	W_4	
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement	5	8	7	14	34

(b) A toy manufacturer uses 48,000 rubber wheels per year for its popular dump truck series. The firm makes its own wheels, which it can produce at a rate of 800 per day. The toy trucks are assembled uniformly over the entire year. Carrying cost is ₹ 10 per wheel a year. Set up cost for a production run of wheels is ₹ 450. The firm operates 240 days per year.
Determine each of the following.
(i) Optimal run size
(ii) Minimum total annual cost for carrying and set up
(iii) Cycle time for the optimal run size
(iv) Run time

3. (a) Suggest optimum assignment of 4 workers A, B, C and D to 4 jobs I, II, III and IV. The time taken (hours) by different workers in completing the different jobs is given below :

Jobs

Workers		(I)	(II)	(III)	(IV)
	A	8	10	12	16
	B	11	11	15	8
	C	9	6	5	14
	D	15	14	9	7

Also, find the total time taken in completing the jobs.

(b)   A vending machine dispenses hot chocolate or coffee. Service time is 30 seconds per cup and is constant. Customers arrive at a mean rate of 80 per hour, and this rate is Poisson - distributed.

Determine :

(i)   The average number of customers waiting in line.

(ii)   The average time customers spend in the system.

(iii)   The average number in the system.

4.   (a)   A manufacturer of toys makes two types of toys, A and B. Processing of these two toys is done on two machines X and Y. The toy A requires two hours on machine X and six hours on machine Y. Toy B requires four hours on machine X and five hours on machine Y. There are sixteen hours of time per day available on machine X and thirty hours on machine Y. The profit obtained on both the toys is the same, i.e., ₹ 5 per toy. Formulate this problem as an integer LP problem.

(b)   Find the optimum strategies for A and B and the value of the game.

B

	1	7	2	4
A	0	3	7	8
	5	2	6	10

5. (a) A company machines and drills two castings X and Y. The time required to machine and drill one casting including machine set - up time is as follows :

Casting	Machine Hours	Drilling Hours
X	4	2
Y	2	5

There are two lathes for machining and three drilling machines. The working week is of 40 hours ; there is no lost time and over time. Variable costs for both castings are ₹ 120 per unit while total fixed costs amount to ₹ 1000 per week. The selling price of casting X is ₹ 300 per unit and that of Y is ₹ 360 per unit. There are no limitations on the number of X and Y casting that can be sold. The company wishes to maximize its profit.

Formulate a linear programming model for the problem

(b) What are the advantages and disadvantages of Monte Carlo simulation as a problem solving technique ?

6. Write short notes on **any four** of the following :
   (a) Degeneracy in L.P. Problem
   (b) Periodic review system in inventory control
   (c) Travelling sales man problem
   (d) Bellman's Principle of Optimality
   (e) Non-Linear Programming
   (f) Impact of Internet on OR

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