MBA(P)III/12.13. 1041

MBA (PT) DEGREE III SEMESTER EXAMINATION DECEMBER 2013

SMP 2305 MANAGEMENT SCIENCE

(Prior to 2012 Admission)

Time: 3 Hours Maximum Marks : 50

(5 x 10 = 50)

I. (a) Define management science? Explain its concepts in detail. (5)

(b) A retail store desires to determine the optimal daily order size for a perishable item. The stores buys the perishable item at the rate of ₹60 per kg and sells at the rate of ₹90 per kg. If the order size is more than the demand, the excess quantity can be sold at ₹75 per kg in a secondary market; otherwise, the opportunity cost for the store is ₹10 per kg for the unsatisfied portion of the demand. Based on the past experience, it is found that the demand varies from 50kg to 200kg in steps of 50kg. The possible values of the order size are from 100 kg to 300 kg in steps of 100 kg. Determine the optimal order size which will maximize the daily profit of the store using Laplace criterion. (5)

OR

II. Consider the payoff matrix of player A as given below and solve it optimally using graphical method. (10)

Player A		Player B				
		1	2	3	4	5
	1	7	8	4	6	8
	2	– 8	6	1	9	6

III. (a) A small manufacturer employs 5 skilled men and 10 semi-skilled men for making a product in two qualities: a deluxe model and an ordinary model. The production of a deluxe model requires 2-hour work by a skilled man and 2-hour work by a semi-skilled man. The ordinary model requires 1-hour work by a skilled man and 3-hour work by a semi-skilled man. According to worker's union rules, no man can work more than 8 hours per day. The profit of the deluxe model is ₹1000 per unit and that of the ordinary model is ₹800 per unit. Formulate a linear programming model for this manufacturing situation to determine the production volume of each model such that the total profit is maximized. (5)

(b) Solve the following LP problem graphically, (5)

Minimize $Z = 45X_1 + 55X_2$

Subject to

$$X_1 + 2X_2 \leq 30$$
$$2X_1 + 3X_2 \leq 80$$
$$X_1 - X_2 \geq 8$$
$$X_1 \text{ and } X_2 \geq 0$$

OR

(P.T.O.)

IV. Solve the following LP problem using simplex method. (10)

Minimize $Z = 3X_1 + 2X_2 + 5X_3$

Subject to

$$X_1 + X_2 + X_3 \leq 9$$
$$2X_1 + 3X_2 + 5X_3 \leq 30$$
$$2X_1 - X_2 - X_3 \leq 8$$
$$X_1, X_3 \text{ and } X_3 \geq 0$$

V. (a) Consider the assignment problem as shown below. In this problem, five different jobs are to be assigned to five different operators such that the total processing time is minimized. The matrix entries represent processing times in hours. Develop a zero-one programming model for the above problem. (5)

		Operator				
		1	2	3	4	5
Job	1	5	6	8	6	4
	2	4	8	7	7	5
	3	7	7	4	5	4
	4	6	5	6	7	5
	5	4	7	8	6	8

(b) Consider the problem of assigning four sales person to four different sales region as shown below such that the total sales is maximized. The cell entries represent annual sales figures in crores of rupees. Find the optimal allocation of the sales persons to different sales region. (5)

		Sales region			
		1	2	3	4
Salesman	1	5	11	8	9
	2	5	7	9	7
	3	7	8	9	9
	4	6	8	11	12

OR

VI. Solve the following transportation problem optimally (10)

		To					Availability
		1	2	3	4	5	
From	1	3	4	6	8	9	20
	2	2	10	1	5	8	30
	3	7	11	20	40	3	15
	4	2	1	9	14	16	13
Demand		40	6	8	18	6	

(Contd....3)

VII. The arrival rate of customers at a banking counter follows Poisson distribution with a mean of 30 per hour. The service rate of the counter clerk also follows Poisson distribution with a mean of 45 per hour.

(i) What is probability of having 0 customer in the system (ρ_0)? (2)

(ii) What is the probability of having 8 customers in the system (ρ_8)? (2)

(iii) Find L_s, L_q, W_s and W_q. (6)

OR

VIII. Consider the following 3 machines and 5 jobs flow shop problem. Check whether Johnson's rule can be extended to this problem. If so, what is the optimal schedule and the corresponding makespan? (10)

Job	Machine 1	Machine 2	Machine 3
1	11	10	12
2	13	8	20
3	15	6	15
4	12	7	19
5	20	9	7

IX. (a) Illustrate Monte-Carlo simulation with an example. (5)

(b) List the method of generating random numbers and explain the steps of any one of them. (5)

OR

X. Consider the details of a project as shown in the table.

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Immediate Predecessor(s)	–	–	–	A	A	B	B	C	C	D	E	F	G	H	I	J, K, L	M, N, O
Duration (months)	4	8	5	4	5	7	4	8	3	6	5	4	12	7	10	5	8

(i) Construct the CPM network (3)

(ii) Determine the critical path (4)

(iii) Determine total floats and free floats for non-critical activities (3)

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