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Printed Pages : 4 **TME-601**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4093 Roll No. | | | | | | | | | | |

B. Tech. (Mech. Engg.)

(SEM. VI) EXAMINATION, 2006-07

OPERATIONS RESEARCH

Time : 3 Hours] *[Total Marks : **100***

Note : *Attempt **all** questions. All questions carry **equal** marks.*

1 Attempt any **two** parts : **10×2=20**

(a) Explain general structure of a linear programming problem using mathematical symbols.

(b) Minimize $Z = 2X_1 + X_2$

Subject to $X_1 + X_2 \geq 1$

$X_1 + 2X_2 \leq 10$

$X_2 \leq 4$

and $X_1 \geq 0$, $X_2 \geq 0$

use graphical method.

(c) Maximize $7 = 2X_1 + X_2$

Subject to $X_1 + 2X_2 \leq 10$

$X_1 + X_2 \leq 6$

$X_1 - X_2 \leq 2$

$X_1 - 2X_2 \leq 1$

and $X_1 \geq 0$, $X_2 \geq 0$

2 Attempt any **two** parts : **10×2=20**

(a) Using simplex method :

Maximise $Z = 10X + 5Y$

Subject to $4X + 5Y \leq 80$

$5X + 2Y \leq 120$

$X,\ Y \geq 0$

(b) An industrialist has three factories located at Agra (A) Bhopal (B) and Chennai (C). The dealers are located at Delhi (1), Nagpur (2) and Calicut (3). The cost of transportation (in Rs.) of unit term from factories to dealers site, along with of number of items available at factories A, B and C, and required by dealers at 1, 2 and 3 as shown below :

From \ *To* →	1	2	3	*FC*
A	3	6	4	10
B	2	5	7	5
C	4	6	8	7
DR	6	8	8	22 / 22

FC : Factory's Capacity

DR : Dealer's Requirement

Find least cost of transportation.

(c) The following matrix shows the profit earned by three sales persons (in Rs.) P_1, P_2, P_3 when they work in three different sales zone Z_1, Z_2 and Z_3

Person \ *Zone* →	Z_1	Z_2	Z_3
P_1	10	15	12
P_2	16	9	13
P_3	12	8	6

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Find which sales person should be assigned which sales zones so that profit should be maximum. Also workout profit.

3 Attempt any **two** parts : **10×2=20**

(a) An ice-cream retailer buys ice-cream at a cost of Rs. 5/- per cup and sells it for Rs. 8/- per cup. Any remaining unsold at the end of the day can be disposed of at a salvage price of Rs. 2 per cup. Past sales have ranged between 15 and 18 cups per day. It is hoped that same trend will continue in near future. Find Expected Monetary Value (EMV) if the sales history has the following probabilities :

Market Size	*Probability Values*
15	0.10
16	0.20
17	0.40
18	0.30

(b) Find the range of values of p an q which will render the entry (2, 2) a saddle point for the game

		Player B		
		2	**4**	**5**
Player A	**10**	**7**	***q***	
	4	***p***	**6**	

(c) Define the following :

(1) Two person zero-sum game
(2) Mixed strategy
(3) Maximin criterio
(4) Minimax criterio.

4 Attempt any **two** parts : **10×2=20**

(a) A firm uses every year 12,000 units of a raw material costing Rs. 1.25 per unit. Ordering cost is Rs. 15/- per order and holding cost is 5% per year of average inventory. Calculate :

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(i) Economic order quantity (EOQ)

(ii) Re-order point, if firm operates 300 days per year and lead time is 14 days and safety stock is 400 units.

(b) Explain ABC analysis of inventory management.

(c) Bengal fish shop is planning for its optimal purchase quantity for a costly variety of fish. The daily demand of the fish follows normal distribution with a mean of 500 and standard deviation of 50 kg. The purchase price of the fish is Rs. 120/kg. The selling price is Rs. 180/kg.If the fish is not sold on the day of purchase, it is sold to a dry manufacturing firm at Rs.100/kg. Find the optimal daily quantity of fish.

5 Attempt any **two** parts : **10×2=20**

(a) Explain following terms as used in waiting line problem

(1) Queue discipline

(2) Balking

(3) Reneging

(4) Jockeying

(b) What do you mean simulation ? Explain Monte-Carlo simulation process.

(c) Workers come to tool room to receive special tools. The average time between arrival is 60 seconds and assumed to be in Poisson distribution. The average service time of tool room attendant is 40 seconds. Determine :

(1) average queue length

(2) average number of workers in the system

(3) mean waiting time of an arrival

(4) Probability that tool room attendant will be idle.