(i) Printed Pages: 7] Roll No.....

(ii) Questions : 10] **Sub. Code :** 3817

Exam. Code : 0502

Master of Commerce 2nd Semester Examination

1047

OPERATIONS RESEARCH

(Same for USOL candidates)

Paper : M.C. 205

Time : 3 Hours] **[Max. Marks : 80**

Note :– Attempt *five* questions in all, selecting at least one question from each Unit. Each question carries **16** marks.

Unit–I

1. (a) Explain degeneracy and infeasibility in LPP.

(b) Solve the following LP - problem by SIMPLEX Method.

Minimize $z = x_1 - 3x_2 + 2x_3$

Subject to

$3x_1 - x_2 + 3x_3 \leq 7$

$-2x_1 + 4x_2 \leq 12$

$-4x_1 + 3x_2 + 5x_3 \geq 10$

$x_1 ; x_2 ;$ and $x_3 \geq 0$

2. Describe the origin and development of Operations Research (OR). Discuss the early Indian scene. Also highlight, how you use OR in day-to-day decision making process.

3. Geetha Perfume Company produces both perfumes and body spray from two flower extract F1 and F2. The following data has been collected :

	Litres of Extract		
	Perfume Body	**Spray Daily**	**availability (Litres)**
Flower Extract, F1	8	4	20
Flower Extract, F2	2	3	8
Profit per litre	7	5	

The maximum daily demand of body spray is 20 bottles of 100 ml each. A market survey indicates that the daily demand of body spray cannot exceed that of perfume by more than 2 litres. The company wants to find out the optimal mix of perfume and body spray that maximizes the total daily profit. Formulate the problem as a linear programming model.

Unit–II

4. The cost of transportation per unit from three sources and four destinations are given here. Obtain initial basic feasible solutions using the following methods :

   (i) North west corner method.

   (ii) Vogel's approximation method.

Source	Destination				Supply
	1	2	3	4	
1	4	2	7	3	250
2	3	7	5	8	450
3	9	4	3	1	500
Demand	200	400	300	300	1200

5. A firm produces a component and distributes them to 5 wholesalers at a fixed price of Rs. 10/unit. Sales forecast indicate that monthly demand will be 3,000, 3,000, 1,000, 5,000 and 4,000 units at wholesale dealers a, b, c, d and e respectively. The monthly production capacities are 5,000, 1,000 and 10,000 at plants A, B and C respectively. The production costs are Rs. 2, Rs. 1 and Rs. 3 at plants A, B, and C respectively. The unit transportation cost in rupees between the plants and wholesalers are given in the following table :

	Wholesales				
Plants	a	b	c	d	e
A	0.5	0.5	1.0	1.5	1.5
B	1.0	0.5	1.0	1.0	1.5
C	1.0	1.0	0.5	1.5	1.0

Determine the transportation schedule between plants and wholesalers in order to maximize the total profit per month Use VAM to obtain the IBFS.

Unit–III

6. A project schedule has following characteristics :

Project Schedule					
Activity	**Name**	**Time (days)**	**Activity**	**Name**	**Time (days)**
1-2	A	4	5-6	G	4
1-3	B	1	5-7	H	8
2-4	C	1	6-8	I	1
3-4	D	1	7-8	J	2
3-5	E	6	8-10	K	5
4-9	F	5	9-10	L	7

(i) Construct PERT

(ii) Compute Te and Tl for each activity.

7. (a) What are some practical objections to the use of Bayesian statistical methods in any context ?

(b) Discuss decision making theory with special reference to uncertainty and risk.

Unit–IV

8. (a) Explain principle of dominance

(b) Solve the game whose pay off matrix is given below :

$$\begin{bmatrix} 8 & 4 & 2 & -1 \\ 9 & 2 & 4 & 3 \\ 4 & -5 & 3 & 0 \\ 3 & -1 & 5 & 2 \\ 7 & 3 & 0 & -3 \end{bmatrix}$$

9. A self-service grocery store employs one cashier at its counter. Eight customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes.

Assuming Poisson distribution for arrival and exponential distribution for service rate, find :

(a) Average number of customers in the system.

(b) Average number of customers in queue.

(c) Average time a customer spends in the system.

(d) Average time a customer waits before being served.

10. (a) Explain Kendal – lee notation for MMI Model.

(b) The arrival of customers at a banking counter follows Poisson distribution with mean of 45 per hour.

(i) What is the probability of having zero customer in the system (P_o) ?

(ii) What is the probability of having 5 customers in the system ? Probability of having 10 customers in the system.

(iii) Determine the steady state performance statistics, namely, L_s, L_q, W_s and W_q ?