

(i) Printed Pages : 4

Roll No.

(ii) Questions : 10

Sub. Code :

3	8	1	7
---	---	---	---

Exam. Code :

0	5	0	2
---	---	---	---

Master of Commerce 2nd Semester

1048

OPERATIONS RESEARCH

(Same for USOL Candidates)

Paper-M.C.-205

Time Allowed : Three Hours]

[Maximum Marks : 80

Note :— Attempt any **five** questions. All questions carry equal marks.

1. "Operations Research is winning the war without entering the field". Discuss.
2. A diet for a sick person must contain at least 4000 units of vitamins, 50 units of minerals and 1400 calories. Two foods A and B are available at a cost of Rs. 4 and Rs. 3 per unit respectively. If one unit of A contains 200 units of vitamins, 1 unit of mineral and 40 calories and one unit of food B contains 100 units of vitamins, 2 units of minerals and 40 calories, find by graphic method what combination of foods be used to have least cost.
3. Solve the LP Problem using big M method :

$$\text{Maximize } Z = 60 X_1 + 80 X_2$$

subject to constraints

$$X_1 \leq 400$$

$$X_2 \geq 200$$

$$X_1 + X_2 = 500$$

$$X_1, X_2 \geq 0 \text{ (Non-negativity constraint).}$$

4. What do you mean by degeneracy in transportation problem ?
How can we deal with this problem ?
5. Tulsian has five plants each of which can manufacture any one of five products. Production costs differ from one plant to another as do sales revenue. Given the revenue and cost data below, obtain which product each plant should produce to maximize profit and also build a mathematical model for this problem :

Plant	Sales Revenue (Rs.) Product					Plant	Production Cost (Rs.) Product				
	1	2	3	4	5		1	2	3	4	5
A	65	78	83	60	95		33	40	43	32	45
B	85	52	59	44	73		45	28	31	23	37
C	83	56	69	64	78		42	29	36	29	41
D	49	80	85	84	73		27	42	44	38	37
E	59	68	83	74	83		30	35	43	39	44

6. A company has three factories $F_i (i = 1, 2, 3)$ from which it transports the product to four warehouses $W_j (j = 1, 2, 3, 4)$. The unit cost of production at the three factories are Rs. 4, 3, 5 respectively. Given the following information on unit costs of transportation, capacities at the three factories and of the requirement at the four warehouses, find the optimum allocation :

Factory	Unit cost of production Rs./unit	Transportation cost Rs./unit				Capacity
		W_1	W_2	W_3	W_4	
F_1	4	5	7	3	8	300
F_2	3	4	6	9	5	500
F_3	5	2	6	4	5	200
Requirements		200	300	400	100	1,000

7. A project consists of activities A, B, C, D, ... H, I. The notation $X < Y$ means that the activity X must be completed before Y can start and $X, Y < W$ means that W will start only after the completion of the activities X and Y. With this notation :

- (i) Construct the network diagram for the following constraints :

$$A < D; A < E; B < F; C < G; D < H; E, F < I.$$

The project has the following time schedules of the above activities :

Task	A	B	C	D	E	F	G	H	I
Least Time	5	18	26	16	15	6	7	7	3
Greatest Time	10	22	40	20	25	12	12	9	5
Most likely Time	8	20	33	18	20	9	10	8	4

- (ii) Determine the following :
- (a) Expected task times and their variance
 - (b) The earliest and latest expected times to reach each node
 - (c) The critical path, and
 - (d) The probability of a node occurring at the proposed completion date if the original contract time of completing the project is 41.5 weeks.
8. Explain the O.P. methodology of solving replacement problems.

9. It is game between the two players where A is maximising player and B is minimising player. Player A wins B's coin if the two coins total are equal to odd number and loses his coin if total of two coins is even. It is game of 1, 2, 5, 10 and 50 rupees coins. Determine the pay off matrix, the best strategies for each player and the value of game to A.
10. Define the term 'Queuing theory'. Discuss various types of Queuing or Waiting time situations alongwith characteristics of waiting time.