B.Sc. III Sem-V

B.Sc.3530 - Mathematics Paper-III (Optional) MAT303 : Linear Programming and Transportation Problem

P. Pages : 3 GUG/S/19/1317

Time : Three Hours Max. Marks : 60

Notes : 1. Solve **all five** questions.
2. Each questions carries equal marks.

UNIT – I

1. a) A company produces two types of hats. Each hat of the first type requires twice as much labour time as the second type. If all hats are of the second type only, the company can produce a total of 500 hats a day. The market limits daily sales of the first and second type to 150 and 250 hats. Assuming that the profits per hat are Rs.8 for type A and Rs. 5 for type B, formulate the problem as a linear programming model in order to determine the number of hats to be produced of each type so as to maximize the profit. **6**

b) Solve the following linear programming problem graphically. **6**

Maximize $Z = 2x_1 + 2x_2$

Such that $x_1 + x_2 \le 10$

$3x_2 - 2x_1 \le 15$

$x_1 \le 6$

and $x_1 \ge 0,\ x_2 \ge 0$

OR

c) Express the following linear programming problem in standard form. **6**

Minimize $Z = x_1 - 2x_2 + x_3$

Subject to $2x_1 + 3x_2 + 4x_3 \ge -4$

$3x_1 + 5x_2 + 2x_3 \ge 7$

$x_1 \ge 0,\ x_2 \ge 0,\ x_3$ is unrestricted in sign.

d) If the convex set of feasible solution of $AX = b,\ X \ge 0$ is a convex-polyhedron, then prove that at least one of the extreme points give an optimal solution. **6**

UNIT – II

2. a) Solve the following linear programming problem by Simplex Method. **6**

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to : $x_1 + 2x_2 + x_3 \le 430,$

$3x_1 + 2x_3 \le 460$

$x_1 + 4x_2 \le 420$

$x_1, x_2, x_3 \ge 0$

b) Solve by simplex method **6**

Maximize $Z = 3x_1 + 2x_2$

Subject to : $x_1 + x_2 \le 4$

$x_1 - x_2 \le 2$

$x_1, x_2 \ge 0$

OR

c) Explain the algorithm of two phase simplex method. **6**

d) Use Big M – Method to solve the following LPP. **6**

Maximize $Z = 3x_1 - x_2$

Subject to $2x_1 + x_2 \ge 2$

$x_1 + 3x_2 \le 3$

$x_2 \le 4$

$x_1 \ge 0,\ x_2 \ge 0$

UNIT – III

3. a) Prove that number of basic variables in transportation problem ore at the most m+n–1. **6**

b) Solve by using North – West Corner Rule Method. **6**

	A	B	C	D	E	Available
1	2	11	10	3	7	4
2	1	4	7	2	1	8
3	3	9	4	8	12	9
Requirements	3	3	4	5	6	21

OR

c) Find the IBFS following transportation problem. By matrix minimum method. **6**

Werehouse Factory	W_1	W_2	W_3	W_4	Factory Capacity
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	24	18
Werehouse Requirement	5	8	7	14	34

d) Find the optimal sol^n to the following using transportation problem by Vogel's approximation method. **6**

					Available
Plants	2	1	11	7	6
	1	0	6	1	1
	5	8	15	9	10
req.	7	5	3	2	

UNIT – IV

4. a) Define assignment problem and give the mathematical formulation of an assignment problem. **6**

b) A departmental head has four tasks to be performed with three subordinates who differ in efficiency. The estimates of time each subordinate will take to perform is given below in the matrix. How should be allocate the tasks one to each man so as to minimize the total man hours. **6**

Man

Task	1	2	3
I	9	26	15
II	13	27	6
III	35	20	15
IV	10	30	20

OR

c) Explain algorithm (Computational procedure) of 'Hungarian Method'. **6**

d) Solve the minimal assignment problem whose effectiveness matrix is given by table. **6**

	1	2	3	4
I	2	3	4	5
II	4	5	6	7
III	7	8	9	8
IV	3	5	8	4

5. Solve **any six.**

a) Define Slack and Surplus variables as involved in the L.P.P. **2**

b) Give general form of LPP. **2**

c) Define a basis matrix in LPP. **2**

d) Define a entering variable and departing variable in LPP. **2**

e) Write mathematical formulation of transformation problem. **2**

f) Define optimal solution of transportation problem. **2**

g) Define unbalanced assignment problem. **2**

h) Give two areas of the applications of assignment problems. **2**

****