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B.A. /B.Sc. (Part-III) Examination, 2022

MATHEMATICS

Fourth (B) Paper

(Linear Programming)

Time : Three Hours] *[Maximum Marks : 75*

Note : Attempt **all** sections as per instructions.

Section - A

(Very Short Answer Type Questions)

Note : Attempt **all** parts of this question. Give answer of each part in about 50 words.

1½×10=15

1. (i) Define the Slack and Surplus variable.
   (ii) Discuss Big-M method.
   (iii) Explain Primal and Dual problems.
   (iv) Describe any method of solving an assignment problem.
   (v) What is the difference between T.P. and A.P.?

P.T.O.

(vi) Define Basic solution and feasible solution.

(vii) Obtain the dual of

$\min z = 60x_1+40x_2$

s.t.c.

$4x_1+x_2 \geq 12$

$9x_1+x_2 \geq 120$

$7x_1+3x_2 \geq 18$

and $x_1, x_2 \geq 0$

(viii) What is difference between Simplex and Dual Simplex Method?

(ix) Define integral programming.

(x) What do you mean by matrix forms of linear programming?

Section - B

(Short Answer Type Questions)

Note : Attempt **all** questions. Give answer of each question in about 200 words.

8×5=40

2. Solve the following L.P.P. by graphical method

$$\max z = 2x_1+3x_2$$

subject to

$$x_1+x_2 \le 400$$

$$2x_1+x_2 \ge 600$$

and $x_1, x_2 \ge 0$

OR

A firm can produce three type of cloth say A, B and C. Three kinds of wool are required for it say red, green and blue wool. One Unit length of type A cloth needs 2 meters of red and 3 meters blue, one unit length of type B cloth needs 3 meters of red, 2 meters green and 2 meters blue and one unit length type C cloth needs 5 meters green and 4 meters blue. The firm has only a stock 8 meters red, 10 meters green and 15 meters blue. It is assumed that the income obtained from the one unit length of type A is Rs. 3, of type B cloth is Rs. 5 and of type c cloth is Rs. 4. Formulate the problem as L.P.P.

P.T.O.

3. Find all basic solution for the system of equation

$$2x_1 + 3x_2 + 4x_3 = 5$$

$$3x_1 + 4x_2 + 5x_3 = 6$$

OR

Solve the L.P. problem by Simplex method.

maximize $z = 3x_1+5x_2+4x_3$

subject to $2x_1+3x_2 \le 8$

$$2x_1+5x_3 \le 10$$

$$3x_1+2x_2 +4x_3 \le 15$$

and $x_1, x_2, x_3 \ge 0$

4. Prove that the dual of the dual is primal.

OR

Solve the following minimal assignment problem.

Job \ Man	1	2	3	4
I	12	30	21	15
II	18	33	9	31
III	44	25	24	21
IV	23	30	28	14

5. Find an initial basic feasible solution of the transportation problem.

	Warehouse				
Factory	w_1	w_2	w_3	w_4	Supply
F_1	1	2	1	4	30
F_2	3	3	2	1	50
F_3	4	2	5	9	20
Demand	20	40	30	10	

OR

Use Branch and Bound technique to solve the following problem :

Max $Z = 7x_1+9x_2$

s.t.c.

$$-x_1+3x_2 \le 6$$
$$7x_1+x_2 \le 35$$

and $0 \le x_1, x_2 \le 7$

and x_1, x_2 are integer.

6. Solve the following L.P.Problem by Dual Simplex method

Min $Z = 3x_1+x_2$

subject to

$$x_1+x_2 \ge 1$$
$$2x_1+3x_2 \ge 2$$

and $x_1, x_2 \ge 0.$

OR

Define Transportation problem. Give the mathematical formulation of transportation problem.

Section - C

(Long Answer Type Questions)

Note : Attempt any **two** questions. Give answer of each question in about 500 words.

$10 \times 2 = 20$

7. Solve the following L.P. Problem by Simplex method with Big-M technique

Max $Z = x_1+2x_2+ 3x_3- x_4$

subject to

$$x_1+ 2x_2+ 3x_3 = 15$$
$$2x_1+ x_2+ 5x_3 = 20$$
$$x_1+ 2x_2+ x_3 + x_4 = 16$$

and $x_1, x_2, x_3, x_4 \ge 0$

8. Use duality to solve the following L.P. problem

Min $Z = 3x_1 + x_2$

subject to

$$2x_1+3x_2 \geq 2$$

$$x_1+ x_2 \geq 1$$

and $x_1, x_2 \geq 0$

9. If x is any feasible solution to the primal problem and y is any feasible solution to the dual problem than prove that

$$Z_x \leq Z_y$$

10. Use Vogel's Approximation Method to obtain an initial basic feasible solution of the following transportation problem.

Factory \ Dealer	A	B	C	D	Available
I	11	13	17	14	250
II	16	18	14	10	300
III	21	24	13	10	400
Demand	200	275	225	250	

11. Solve the following L.P. Problem by Revised Simplex method

Maximize $Z = 6x_1+2x_2+ 4x_3- 2x_4+ x_5$

subject to

$$2x_1+ 3x_2+ 3x_3 + x_4 = 10$$

$$x_1+ 2x_2+ x_3+ x_5 = 8$$

and $x_1, x_2, x_3, x_4 , x_5 \geq 0$