Roll No. .....

D–3760

M. A./M. Sc. (Final) EXAMINATION, 2020

MATHEMATICS

(Optional)

Paper Fourth (*i*)

(Operations Research)

Time : Three Hours] [*Maximum Marks : 100*

Note : All questions are compulsory. Attempt any *two* parts from each question. All questions carry equal marks.

Unit—I

1. (a) Use Simplex method to solve the following L. P. P. :

Maximize :

$$z = 3x_1 + 2x_2$$

Subject to the constraints :

$$x_1 + x_2 \leq 4$$

$$x_1 - x_2 \leq 2$$

$$x_1 \geq 0\,,\ x_2 \geq 0\,.$$

(b) Use dual Simplex method to solve the following L. P. P. :

Minimize :

$$z = 3x_1 + x_2$$

Subject to the constraints :

$$x_1 + x_2 \geq 1$$

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

$$x_1, x_2 \geq 0 .$$

(c) Use penalty method to :

Maximize :

$$z = 6x_1 + 4x_2$$

Subject to the constraints :

$$2x_1 + 3x_2 \leq 30$$

$$3x_1 + 2x_2 \leq 24$$

$$x_1 + x_2 \geq 3$$

$$x_1 \geq 0$$

and $x_2 \geq 0$.

Unit—II

2. (a) Use Vogel's Approximation method to obtain an initial basic feasible solution of the Transportation problem :

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

(b) Solve the following Assignment problem :

	A	B	C	D
I	1	4	6	3
II	9	7	10	9
III	4	5	11	7
IV	8	7	8	5

(c) Draw a network diagram for the following data :

Activity	Preceded by
A	–
B	A
C	A
D	A
E	C, D
F	D
G	E
H	G
I	F, H
J	B, I

Unit—III

3. (a) Use Dynamic programming to solve :

Maximize :

$$z = y_1 . y_2 . y_3 , ..., y_n$$

Subject to the constraints :

$$y_1 + y_2 + ... + y_n = c$$

and

$$y_i \geq 0, \ i = 1, 2, 3, ..., n .$$

(b) Two players A and B match coins. If the coins match, then A wins two units of value, if the coins do not match, then B wins two units of value. Determine the optimum strategies for the players and the value of the game.

(c) Find the optimum integer solution to the following L. P. P. :

Maximize :

$$z = x_1 + 4x_2$$

Subject to the constraints :

$$2x_1 + 4x_2 \leq 7$$

$$5x_1 + 3x_2 \leq 15$$

$$x_1, x_2 \geq 0$$

and are integers.

Unit—IV

4. (a) Write a short note on optimal product mix and activity levels.

(b) Explain Blending problems.

(c) Explain Petroleum refinery operations.

Unit—V

5. (a) Determine x_1, x_2 and x_3 so as to :

Maximize :

$$z = -x_1^2 - x_2^2 - x_3^2 + 4x_1 + 6x_2$$

Subject to the constraints :

$$x_1 + x_2 \leq 2$$

$$2x_1 + 3x_2 \leq 12$$

$$x_1, x_2 \geq 0 .$$

(b) Use Beale's method to solve the following NLPP :

Minimize :

$$z = 6 - 6x_1 + 2x_1^2 - 2x_1 x_2 + 2x_2^2$$

Subject to the constraints :

$$x_1 + x_2 \leq 2 \text{ and } x_1, x_2 \geq 0 .$$

(c) Use Wolfe's method to solve the following Q. P. P. :

Maximize :

$$z = 2x_1 + 3x_2 - 2x_1^2$$

Subject to the constraints :

$$x_1 + 4x_2 \leq 4$$

$$x_1 + x_2 \leq 2$$

$$x_1, x_2 \geq 0 .$$