AF-3568

M.A./M.Sc. (Final)
Term End Examination, 2017-18

MATHEMATICS

Paper - VIII

Operations Research

Time : Three Hours] [*Maximum Marks* : 100
[*Minimum Pass Marks* : 36

Note : Answer any **five** questions. The figures in the right-hand margin indicate marks.

1. (*a*) By using Simplex method to solve the following Linear Programming Problem :

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

Subject to the constraints,

$$x_1 + 2x_2 + x_3 \leq 430$$
$$3x_1 + 2x_3 \leq 460$$
$$x_1 + 4x_2 \leq 420 \text{ and}$$
$$x_1, x_2 \geq 0$$

(*b*) A firm manufactures two types of products *A* and *B* and sells them at a profit of ₹ 2 on type *A* and ₹ 3 on type *B*. Each product is processed on two

machines G and H. Type A requires one minute of processing time on G and two minutes on H. Type B requires one minute on G and one minute on H. The machine G is available for not more than 6 hours 40 minutes while machine H is available for 10 hours during any working day.

Formulate the problem as a linear programming problem.

2. Use Dual Simplex Method to solve the following Linear Programming Problem :

Minimize $Z = 2x_1 + x_2$

Subject to the constraints,

$$3x_1 + x_2 \geq 3$$
$$4x_1 + 3x_2 \geq 6$$
$$x_1 + 2x_2 \geq 3 \text{ and}$$
$$x_1, x_2, x_3 \geq 0$$

3. Solve the assignment problem represented by the following matrix :

	I	*II*	*III*	*IV*	*V*	*VI*
A	9	22	58	11	19	27
B	43	78	72	50	63	48
C	41	28	91	37	45	33
D	74	42	27	49	39	32
E	36	11	57	22	25	18
F	3	56	53	31	17	28

4. Solve the following Transportation problem :

To

From	D_1	D_2	D_3	D_4	$a_i \downarrow$
O_1	5	3	6	2	19
O_2	4	7	9	1	37
O_3	3	4	7	5	34
$b_j \rightarrow$	16	18	31	25	

5. Draw a network diagram on the basis of the following data :

Activity	Duration (Days)
1-2	2
1-4	2
1-7	1
2-3	4
3-6	1
4-5	5
4-8	8
5-6	4
6-9	3
7-8	3
8-9	5
9-10	2

Find the critical path, total duration and slack times.

6. Solve the following (2×4) game by Graphical method :

		B			
		I	*II*	*III*	*IV*
A	*I*	2	2	3	–1
	II	4	3	2	6

7. Solve the following Linear Programming Problem by Dynamic Programming technique :

Maximize $Z = 3x_1 + 5x_2$

Subject to the constraints,

$$x_1 \leq 4$$
$$x_2 \leq 6$$
$$3x_1 + 2x_2 \leq 18$$
$$x_1, x_2 \geq 0$$

8. (*a*) Write an essay on Blending Problem (in about 200 words).

(*b*) Write a short note on Petroleum Refinery Operations.

9. (*a*) Write the interior point algorithm for solving linear programming problem.

(*b*) Explain goal programming in detail. Give an example to explain goal programming.

10. For the following L. P. P.

Minimize $Z = \lambda x_1 - \lambda x_2 - x_3 + x_4$

Subject to the constraints,

$$3x_1 - 3x_2 - x_3 + x_4 \geq 5$$
$$2x_1 - 2x_2 + x_3 - x_4 \leq 3 \text{ and}$$
$$x_1,\ x_2,\ x_3,\ x_4 \geq 0$$

Find the range of λ over which the solution remain basic feasible and optimal.

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