

FACULTY OF SCIENCE
M.Sc. III – Semester Examination, January 2018

Subject: Mathematics / Applied Mathematics
Paper – IV (A)
Operations Research

Time: 3 Hours

Max.Marks: 80

Note: Answer all questions from Part-A and Part-B.
Each question carries 4 marks in Part-A and 12 marks in Part-B.

PART – A (8x4 = 32 Marks)
[Short Answer Type]

- 1 Explain the concept of duality with an example.
- 2 How do you resolve degeneracy in LPP?
- 3 Explain the mathematical formulation of transportation problem.
- 4 Explain briefly about traveling salesman problem.
- 5 What are the characteristics of a dynamic programming problem?
- 6 Explain the concept of dynamic programming technique.
- 7 Define critical path and network.
- 8 State the rules for drawing a network.

PART – B (4x12 = 48 Marks)
[Essay Answer Type]

- 9 a) i) Write the algorithm for solving LPP using Big M method.
 ii) Obtain the dual of minimize $z = 40x_1 + 120x_2$;
 Subject to constraints: $x_1 - 2x_2 \leq 8$, $3x_1 + 5x_2 = 90$, $15x_1 + 44x_2 \leq 660$, $x_1, x_2 \geq 0$.

OR

- b) i) Solve the following LPP by graphical method.

Minimize $z = 20x_1 + 40x_2$;

Subject to constraints: $36x_1 + 6x_2 \geq 108$,
 $3x_1 + 12x_2 \geq 36$,
 $20x_1 + 10x_2 \geq 100$
 $x_1, x_2 \geq 0$.

- ii) How can you obtain alternative solutions to an LPP when it is solved by simplex method? Explain.

- 10 a) Explain the concept of assignment problem and write the algorithm for obtaining an optimum solution to an assignment problem using Hungarian method.

OR

- b) Obtain the IBFS to the following TPP by (i) North-West corner rule and (ii) Vogel's Approximation Method.

From \ To	I	II	III	IV	V	Supply
A	20	18	18	21	10	100
B	21	22	23	20	24	125
C	18	19	21	18	19	175
Requirement	60	80	85	105	70	

- 11 a) Use dynamic programming technique to show that $p_1 \log p_1 + p_2 \log p_2 + \dots + p_n \log p_n$ Subject to constraints: $p_1 + p_2 + \dots + p_n = 1$ and $p_i \geq 0, \forall i$ is minimum when

$$p_1 = p_2 = \dots = p_n = \frac{1}{n}$$

OR

- b) State Bellman's principle of optimality and find the minimum value of $z = y_1^2 + y_2^2 + \dots + y_n^2$; STC $y_1 \cdot y_2 \dots y_n = c, c \neq 0$ and $y_j \geq 0; j = 1, 2, \dots, n$.

- 12 a) Draw the network diagram and obtain critical path to the following activities

Activity	1-2	1-3	1-4	2-5	2-6	3-6	4-7	5-7	6-7
Optimistic time	3	2	6	2	5	3	3	1	2
Pessimistic time	15	4	30	8	17	15	27	7	8
Most likely time	6	4	12	5	11	6	9	4	5

OR

- b) i) Write about various floats involved in a network.
 ii) Distinguish between CPM and PERT and
 iii) What are the advantages and limitations of CPM?
