

Day: Friday  
Date: 23/11/2018

W-2018-3135

Time: 11.00 AM TO 02.00 PM  
Max Marks: 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SEPARATE** answer books.
- 4) Assume suitable data if necessary.

SECTION – I

Q.1 a) Explain the terms: [05]

- i) Slack variable
- ii) Surplus variable
- iii) Artificial variable
- iv) Degeneracy in LP

b) Find the dual of the following LPP [05]

Maximize  $z = 3x_1 - x_2 + x_3$

Subject to  $4x_1 - x_2 \leq 8$

$8x_1 + x_2 + 3x_3 \geq 12$

$5x_1 - 6x_3 \leq 13$

$x_1, x_2, x_3 \geq 0$

OR

Explain big M method. [10]

Q.2 Find the optimum solution to the following transportation problem in which the cells contain transportation cost in Rs. [10]

	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	W <sub>5</sub>	Available
F <sub>1</sub>	7	6	4	5	3	40
F <sub>2</sub>	8	5	6	7	8	30
F <sub>3</sub>	6	8	9	6	5	20
F <sub>4</sub>	5	7	7	8	6	10
Required	30	30	15	20	5	

OR

A captain of a cricket team has to allot five middle order batting positions to five batsmen. The average runs scored by each batsman at these positions are given in the following table: [10]

	III	IV	V	VI	VII
A	40	40	35	25	50
B	42	30	16	25	27
C	50	48	40	60	50
D	20	19	20	18	25
E	58	60	59	55	53

Make the assignment so that the expected total average runs scored by these batsmen are maximum.

P.T.O.

- Q.3** a) Explain Newton's method for optimization of multivariable unconstrained NLPP. [05]
- b) Use Fibonacci method to Minimize  $f(x) = x(x^2 - 1)$  in the interval (0, 2) to an accuracy of 0.2%. [05]

**OR**

- a) Explain Dichotomous search technique. [05]
- b) Use steepest ascent method to maximize  $f(x_1, x_2) = 2x_1x_2 - 2x_1^2 + 6x_2$ . [05]

**SECTION – II**

- Q.4** a) Discuss Bellman's principle of optimality with respect to Dynamic Programming. [05]
- b) Solve the NLPP [05]  
 Maximize  $z = 4x_1 - x_1^2 + 8x_2 - x_2^2$   
 Subject to  $x_1 + x_2 = 2$   
 $x_1, x_2 \geq 0$

**OR**

- Use the Kuhn-Tucker conditions to solve the following NLPP. [10]  
 Maximize  $z = 2x_1 - x_1^2 + x_2$   
 Subject to  $2x_1 + 3x_2 \leq 6$   
 $2x_1 + x_2 \leq 4$   
 $x_1, x_2 \geq 0$

- Q.5** Explain the basic concept of Simulated Annealing. [10]

**OR**

- Discuss Genetic Algorithm with reference to working principle, GA operators and fitness function. [10]

- Q.6** Discuss an application of optimization technique to reservoir operation. [10]

**OR**

- Explain how optimization technique can be applied to crop yield optimization. [10]

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