

## THE LNM INSTITUTE OF INFORMATION TECHNOLOGY DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

## Optimization Techniques and Applications Mid-Term Examination

Time: 90 minutes (2.30 - 4.00 PM)

Maximum Marks: 30

[6]

Date: 01/10/2018

Answer all questions

Inst: Calculator may be used for simple mathematical computations.

## PART-A

Solve the following LP Problem by using Simplex method. Maximize  $Z = 4x_1 + 3x_2$  subject to the constraints

- $2x_1 + x_2 \le 1,000$
- $x_1 + x_2 \le 800$
- $x_1 \le 400$
- $x_2 \le 700$

and  $x_1, x_2 \ge 0$ 

2. Solve the following LP Problem by using Big-M method.

Maximize  $Z = 2x_1 + 3x_2 + 4x_3$ 

Subject to constraints

0 60 120

- $3x_1 + x_2 + 4x_3 \le 600$
- $2x_1 + 4x_2 + 2x_3 \ge 480$
- $2x_1 + 3x_2 + 3x_3 = 540$

and  $x_1, x_2, x_3 \ge 0$ 

3. Solve the following LP Problem by using Dual Simplex method.

Maximize  $Z = -2x_1 - 2x_2 - 4x_3$ Subject to constraints

- $2x_1 + 3x_2 + 5x_3 \ge 2$
- $3x_1 + x_2 + 7x_3 \le 3$
- $x_1 + 4x_2 + 6x_3 \le 5$

and  $x_1, x_2, x_3 \ge 0$ 

Please turn →

[6]

## PART-B

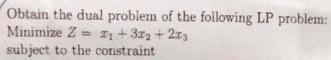
A manufacturing firm has discontinued the production of a certain unprofitable product line. This has created considerable excess production capability. Management is considering to devoting this excess capacity to one or more of three products call them product 1, 2 and 3. The availability capacity on the machines that might limit output is summarized in the following table:

Machine Type	Available Time		
	( in Machine-hours per weeks)		
Milling Machine	165		
Lathe	150		
Grinder	50		

The number of machine hours required for each unit of respective product is as follows:

Machine Type	Productivity (in Machine per unit)			
	Product-1	Product-2	Product-3	
Milling Machine	8	2	3	
Lathe	4	3	0	
Grinder	2	_	1	

The profit per unit would be Rs 20, Rs 6 and Rs 8 respectively for product 1, 2 and 3. Formulate into LP model to find how much of each product the firm should produce in order to maximize its profit.



• 
$$2x_1 + 4x_2 + x_3 \le 5$$

• 
$$x_1 - x_2 + 3x_3 = 7$$

• 
$$x_1 + x_2 > 6$$

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

Obtain the solution of the following Nonlinear Programming problem using Direct substitution method and test the extreme point whether that maximize or minimize of the given objective function.

Optimize 
$$Z = 3x_1^2 + x_2^2 + x_3^2$$
  
Subject to  $x_1 + x_2 + x_3 = 2$ 

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

\*\*\*\*END\*\*\*