

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/SP20**)

CLASS: IMSC
BRANCH: MATHEMATICS

SEMESTER : VI
SESSION : SP/2023

SUBJECT: MA309 OPTIMIZATION TECHNIQUES

TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Graph will be supplied to the candidates

- Q.1(a) Define unrestricted variables. [2] 1 CO BL LO
- Q.1(b) A call centre has a daily minimum requirements for personnel as in table below: [3] 1 CO BL HO

Time of the day	Period	Minimum number of people required
2-6	1	20
6-10	2	15
10-14	3	8
14-18	4	6
18-22	5	12
22-24	6	30

Formulate a LPP to find an optimal schedule

- Q.2(a) How to remove degeneracy in case of tie between leaving variables in simplex method. [2] 1 CO BL LO
- Q.2(b) For a primal problem [3] 1 CO BL HO
 Max $Z=50x+40y$
 Subject to:
 $3x+4y \leq 60$
 $2x+3y \leq 70$
 $x, y \geq 0$
 Write the dual of the problem.

- Q.3(a) Is the transportation model an example of decision making under certainty or under uncertainty? Why? [2] 2 CO BL IO
- Q.3(b) Solve by Least cost method [3] 2 CO BL HO

	D1	D2	D3	D4	Supply
P1	2	3	11	7	6
P2	1	0	6	1	1
P3	5	8	15	9	10
Demand	7	5	3	2	

- Q.4(a) Define assignment problem [2] CO BL IO
- Q.4(b) Solve the assignment problem. [3] CO BL IO

15	13	14	17
11	12	15	13
13	12	10	11
15	17	14	16

PTO

Q.5(a) Basic difference between Parametric Programming and sensitivity analysis.

[2] 3 IO

Q.5(b) Consider a parametric LPP problem & solution at $t=0$,

[3] 3 HO

$$\text{Min } Z = (-1+2\lambda)x + (-3+\lambda)y$$

Subject to:

$$x+y \leq 6$$

$$-x+2y \leq 6$$

$$x, y \geq 0$$

The solution above LPP is as

BASIC	x	y	S1	S2	Solution
Z	0	0	-5/3	-2/3	-14
x	1	0	2/3	-1/3	2
Y	0	1	1/3	1/3	4

Find the leaving and entering variables as per parametric programming

.....23/02/2023.....M