

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

CLASS: BE
BRANCH: IT

SEMESTER: VI
SESSION: SP/2020

SUBJECT: IT6027-OPTIMIZATION TECHNIQUES

TIME: 1.5 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.
6. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- Q1 (a) Explain the linear programming problem giving two examples. [2]
 (b) Use the graphical method to solve the following LPP: [3]
 $\text{Max } Z = 2x_1 + 3x_2$, subject to constraint : $x_1 + x_2 \leq 30$, $x_1 - x_2 \geq 0$, $x_2 \geq 3$, $0 \leq x_1 \leq 20$ and $0 \leq x_2 \leq 12$.
- Q2 (a) Write down the standard form of LPP. [2]
 (b) Use simplex method to solve the following LPP: [3]
 $\text{Max } Z = 4x_1 + 10x_2$, subject to constraint $2x_1 + x_2 \leq 50$, $2x_1 + 5x_2 \leq 100$, $2x_1 + 3x_2 \leq 90$, $x_1 \geq 0$ and $x_2 \geq 0$.
- Q3 (a) Illustrate the difference between simplex and revised simplex method. [2]
 (b) Consider the following LPP . $\text{Max } Z = 5x_1 + 4x_2 + 3x_3$, subject to constraint $2x_1 + x_2 + x_3 \leq 10$, $x_1 + 2x_2 + x_3 \leq 8$ and $x_1 \geq 0$, $x_2 \geq 0$. suppose that the current basic solution is $X_B = (x_1, x_3)$. check whether the current basic variable solution is optimal or not using revised simplex method. [3]
- Q4 (a) Illustrate the weak duality and strong duality property in duality. [2]
 (b) Write the dual of the following LPP problem. [3]
 $\text{Min } Z = 3x_1 - 2x_2 + 4x_3$, subject to constraint, $3x_1 + 5x_2 + 4x_3 \geq 7$, $6x_1 + x_2 + 3x_3 \leq 4$, $7x_1 - 2x_2 - x_3 \leq 10$, $x_1 - 2x_2 + 5x_3 \geq 3$, $4x_1 + 7x_2 - 2x_3 \geq 2$ and $x_1 \geq 0$, $x_2 \geq 0$, $x_3 \geq 0$
- Q5 (a) What is optimality condition in dual simplex method? [2]
 (b) Use dual simplex method to solve the following LPP: [3]
 $\text{Min } Z = 3x_1 + x_2$, st, $x_1 + x_2 \geq 1$, $2x_1 + 3x_2 \geq 2$ and $x_1 \geq 0$, $x_2 \geq 0$.
- Q6 (a) Write down the two applications of maximum flow in network model. [2]
 (b) Consider the maximal flow problem for the network given below. the source is node 1, the sink is node 6 and the link capacities are shown on the directed arcs. use the augmented path algorithm to find the maximal flow. [3]

