

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-1 EXAMINATION-SEPTEMBER-2023

B.Tech-VII Semester

COURSE CODE (CREDITS): 19B1WEC733 (3)

MAX. MARKS: 15

COURSE NAME: Optimization Techniques

COURSE INSTRUCTOR: Dr. Pardeep Garg

MAX. TIME: 1 Hour

*Note: (a) All questions are compulsory. (b) Marks are indicated against each question in square brackets. (c) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.*

**Q1.** What is operations Research (O.R.)? Enumerate six applications of O. R. 'O. R. is the art of winning war without actually fighting it' justify this statement by describing the history of O.R.

[CO-1, 1+1+1=3 marks]

**Q2.** A firm manufactures 3 products A, B, and C. The profits are Rs. 8, Rs. 6, and Rs. 9 respectively. The firm has 2 machines and the required time in minutes for each machine on each product is shown in Table 1. Machine G and H have 2000 and 2500 machine-minutes, respectively. The firm must manufacture 100 A's, 200 B's, and 50 C's, but no more than 150 A's. Formulate this problem as a linear programming problem (LPP) showing the objective function and all the constraints.

[CO-1, 3 marks]

Table 1.

Machine	G	Product		
		A	B	C
	H	4	3	5
		2	2	4

**Q3.** A firm plans to purchase at least 200 quintals of scrap containing high quality metal X and low quality metal Y. It decides that the scrap to be purchased must contain at least 100 quintals of X-metal and not more than 35 quintals of Y-metal. The firm can purchase the scrap from two suppliers (A and B) in unlimited quantities. The percentage of X and Y metals in terms of weight in the scraps supplied by A and B is shown in Table 2:

Table 2.

Metals	Supplier A	Supplier B
X	25%	75%
Y	10%	20%

The price of A's scrap is Rs. 200 per quintal and that of B's is Rs. 400 per quintal. Formulate this problem as a linear programming problem (LPP) showing the objective function and all the constraints. Also, solve it to determine the quantities that the firm should buy from the two suppliers so as to minimize total purchase cost using Graphical method. [CO-1, 1+4=5 marks]

**Q4.** Using Simplex method, solve the following problem:

Max.  $z=3x_1+2x_2+5x_3$ , subject to the constraints:

$x_1+2x_2+x_3 \leq 430$ ,  $3x_1+2x_3 \leq 460$ ,  $x_1+4x_2 \leq 420$ , and  $x_1, x_2, x_3 \geq 0$ . [CO-1, 4 marks]