

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2024

M.Tech-I Semester (SE)

COURSE CODE (CREDITS): 11M1WCE114(3)

MAX. MARKS: 25

COURSE NAME: Modelling Simulation and Computer Applications

COURSE INSTRUCTORS: Dr. Tanmay Gupta

MAX. TIME: 1 Hour 30 Minutes

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.1 The products A, B and C are produced in three machine centres X, Y and Z. Each product involves operation of each of the machine centres. The time required for each operation for unit amount of each product is as follows, for Product A time in hours for X, Y, Z is 10,7,2 similarly for B 2,3,4 and for C 1,2,1. Total available time are 100, 77 and 80 hours at machine centres X, Y and Z respectively. The profit per unit of A, B and C is Rs. 12, Rs. 3 and Rs. 1 respectively. Find out a suitable product mix so as to maximize the profit. **[4]**

Q.2 Formulate the dual of Q.1 and solve the dual-by-dual simplex method. **[5]**

Q.3 Solve using Big M method

Maximize: $z = -12.5X_1 - 14.5X_2$

Subjected to

$$X_1 + X_2 \geq 2000$$

$$0.4X_1 + 0.75X_2 \geq 1000$$

$$0.075X_1 + 0.1X_2 \leq 200$$

$$X_1, X_2 \geq 0 \quad \mathbf{[5]}$$

Q.4 Using two phase method prove that following problem has no feasible solution:

Minimize: $z = 200X_1 + 300X_2$

Subjected to

$$2X_1 + 3X_2 \geq 1200$$

$$2X_1 + 1.5X_2 \geq 900$$

$$X_1 + X_2 \leq 400$$

$$X_1, X_2 \geq 0 \quad \mathbf{[5]}$$

Q.5 HiDec produces two models of electronic gadgets that use resistors, capacitors, and chips. The following table summarizes the data of the situation:

Resource	Model1 (units)	Model 2 (Units)	Max Availability (units)
Resistor	2	3	1200
Capacitor	2	1	1000
Chips	0	4	800
Unit Profit (\$)	3	4	

Final optimal table for above problem is

Basic	Z	X1	X2	S1	S2	S3	Sol
Z	1	0	0	5/4	1/4	0	1750
X1	0	1	0	-1/4	3/4	0	450
S3	0	0	0	-2	2	1	400
X2	0	0	1	1/2	-1/2	0	100

- Determine the range of applicability of dual prices for capacitors
- If availability of capacitors is increased to 900 find the new optimum solution
- Determine the conditions that will keep the current solution optimum if the unit profits of Models 1 and 2 are changed simultaneously.

[6]