

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY,
WAKNAGHAT

TEST – 3, DECEMBER 2019

Dr. Tamay Gupta

MTech 1st Semester Structural Engineering

Course Code: 11M1WCE114

Max. Marks: 35

Course Name: Modelling, Simulation and Computer Applications

Max. Time: 2 hr.

Course Credits: 03

Note: All questions are compulsory. Marks are indicated against the questions. Carrying of mobile phone is strictly prohibited and will be treated as case of unfair means.

- Q.1 (a) What do you understand by terms “Modelling” and “Simulation”? Elaborate upon advantages and disadvantages of performing modelling and simulation. [4]
(b) Enumerate any 6 application of engineering applications of optimization. [1.5]
(c) Give any 6 classification for optimization problems. [1.5]

Q.2 Solve the following LPP by simplex method and write its Dual & find its solution

$$\begin{aligned} &\text{Minimize } -x_1 - 4x_2 - 3x_3 \\ &\text{subject to } 2x_1 + 2x_2 + x_3 \leq 4 \\ &\quad \quad \quad x_1 + 2x_2 + 2x_3 \leq 6 \\ &\quad \quad \quad x_1 \geq 0, \quad x_2 \geq 0, \quad x_3 \geq 0 \end{aligned} \quad [6]$$

Q.3 Solve by Dual Simplex Method

$$\begin{aligned} &\text{Minimize } 3x_1 + 4x_2 + 5x_3 \\ &\text{subject to } x_1 + 2x_2 + 3x_3 \geq 5 \\ &\quad \quad \quad 2x_1 + 2x_2 + x_3 \geq 6 \\ &\quad \quad \quad x_1 \geq 0, \quad x_2 \geq 0, \quad x_3 \geq 0 \end{aligned} \quad [4]$$

Q.3 Solve the following transportation problem to find the optimum cost [5]

	1	2	3	4	Supply
1	5	9	-	4	28
2	6	10	3	-	32
3	4	2	5	7	60
Demand	48	29	40	33	

Q.4 A cooperative society of farmers has 50 hectares of land to grow two crops X and Y. The profit from crops X and Y per hectare are estimated as Rs 10500 and 9000 respectively. To control weeds, a liquid herbicide must be used for crops X and Y at rates of 20 litres and 10 litres per hectare. Further, no more than 800 litres of herbicide should be used in order to protect fish and wildlife using a pond which collects drainage from this land. How much land should be allocated to each crop so as to maximise the total profit of the society? You may use graphical solution for the problem. [4]

Q.5 Four building companies have presented their projects to a competition called to build buildings A, B, C and D. Each builder must be assigned the construction of a building. The following tableau shows the time each building company needs to build each of the buildings. The objective is to assign the construction of a building to each building company so that the total building time is minimized. Find out the optimum assignment and cost. [5]

	1	2	3	4
A	58	58	60	54
B	66	70	70	78
C	106	104	100	95
D	52	54	64	54

Q.6 Consider the LPP [4]

$$\begin{aligned}
 &\text{Maximize } 5x_1 + 2x_2 + 3x_3 \\
 &\text{subject to } x_1 + 5x_2 + 2x_3 = 30 \\
 &\quad \quad \quad x_1 - 5x_2 - 6x_3 \leq 40 \\
 &\quad \quad \quad x_1 \geq 0, \quad x_2 \geq 0, \quad x_3 \geq 0
 \end{aligned}$$

If the Primal objective row is given by where artificial x_4 and slack x_5 are the starting basic variables: $z + 0x_1 + 23x_2 + 7x_3 + (5 + M)x_4 + 0x_5 = 150$

Write the associated dual problem and determine its optimal solution from optimal z equation.