Model Question Paper

COURSE: M.TECH. **BRANCH**: POWER SYSTEM

SEMESTER: 3 **SUBJECT**: OPERATIONS RESEARCH

Duration: 3:00 hrs **Max marks: 100**

Note: Attempt all questions.

1. **Attempt any four parts of the following.** **5x4 =20**

   A. Discuss the Kuhn – Tucker (KKT) conditions for determination of optimality.

   B. Explain the meaning of degeneracy in Transportation problem.

   C. Define Simulation. Explain the characteristics of various types of simulation models.

   D. Give the mathematical formulation of an assignment problem

   E. Write the steps involved in the North-West Corner Rule for finding an initial basic feasible solution to a transportation problem.

2. **Attempt any two parts of the following.** **10x2=20**

   A. A project consists of seven activities for which the relevant data are given below:

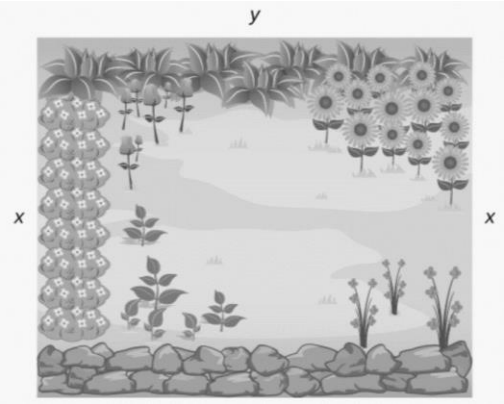
Activity	**Preceding activities**	**Duration (days)**
A	---	4
B	---	7
C	---	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

   i. Draw the network.
   ii. Identify the critical path and find the project completion time

   B. Use graphical method to:

   Maximize: $Z = 5x_1 + x_2$; subject to $x_1 + x_2 \leq 10$, $2x_1 + 3x_2 \geq 10$; $x_1, x_2 \geq 0$

   C. A rectangular garden is to be constructed using a rock wall as one side of the garden and wire fencing for the other three sides (Figure 2C). Given 100ft100ft of wire fencing, determine the dimensions that would create a garden of maximum area. What is the maximum area?



(Figure 2C)

3. Attempt any two parts of the following. 10x2=20

A. Obtain the optimal assignment of four jobs and four machines when the cost of assignment is given by the following table:

	J_1	J_2	J_3	J_4
M_1	10	9	8	7
M_2	3	4	5	6
M_3	2	1	1	2
M_4	4	3	5	6

B. Represent the following LPP given in standard form in matrix-vector notation: Maximize

$Z = x1 + 2x2 - 3x3 + 4x4$

Subject to $2x1 + 2x2 + x3 + 5x4 = 7$

$3x2 - 2x3 + x4 = 2$

$4x1 + 7x2 + 3x3 + x4 = 5$

$x1, x2, x3, x4 \geq 0$

C. Solve the following game by using the principle of dominance:

4	2	0	2	1	1
4	3	1	3	2	2
4	3	7	-5	1	2
4	3	4	-1	2	2
4	3	3	-2	2	2

4. Attempt any two parts of the following. 10x2=20

A. Using Hook-Jeeves method, Min Y = 2+(x12-x2)2+x22. Take starting point as (-3,-4), . Show calculations for complete two cycles.

B. A Company wishes to schedule the production of a kitchen appliance that requires two resources – labour and material. The company is considering three differentmodels and its production engineering department has furnished the following data:

	Model		
	A	B	C
Labour (hours per unit)	7	3	6
Material (pounds per unit)	4	4	5
Profit ($ per unit)	4	2	3

The supply of raw material is restricted to 200 pounds per day. The daily availability of labour is 150 hours. Formulating this as a linear programming model to determine the daily production rate of the various models in order to maximize the total profit.

C. Solve the LPP problem by Big M method:
Max Z = □ 4x1 + 5x2 - 3x3 + 50
st x1 + x2 + x3 = 10
x1 – x2 ≥ 1
$2x_1 + 3x_2 + x_3 \leq 40 \quad x_i \geq 0 \forall i$

5. Attempt any two parts of the following. 10x2=20

A. Mention the characteristics of Fibonacci method. Min f = x2-10e0.1x in the interval (-10, 5) to the accuracy of 10%. Use Fibonacci Method. Calculate the actual accuracy achieved.

B. A company has three production facilities S_1, S_2 and S_3 with production capacity of 7, 9 and 18 units (in 100s) per week of a product, respectively. These units are to be shipped to four warehouses D_1, D_2, D_3 and D_4 with requirement of 5, 8, 7 and 14 units (in 100s) per week, respectively. The transportation costs (in rupees) per unit between factories towarehouses are given below. Obtain an optimal solution.

	D_1	D_2	D_3	D_4	Capacity
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	34

C. Obtain an initial basic feasible solution to the following transportation problem using the north-west corner rule.

	M_1	M_2	M_3	M_4	Warehouse Capacity
W_1	11	13	17	14	250
W_2	16	18	14	10	300
W_3	21	24	13	10	400
Market Demand	200	225	275	250	