Registration No.: | | | | | | | | | | |

Total Number of Pages: 02

Course: M.Sc.I
Sub_Code: FMCC803

8th Semester Regular Examination: 2024-25
SUBJECT: OPTIMIZATION TECHNIQUES
BRANCH(S): M.Sc.I(MC)
Time: 3 Hours
Max Marks: 70
Q.Code: S111
Answer Question No.1 (Part-I) which is compulsory, any five from rest (Part-II)
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions :** **(2 x 10)**

a) What is the value of the game, If the payoff matrix of a game is $\begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix}$.

b) During the process of fractional cut method how many Gomory's constraints are required to generate?

c) Write two differences between goal programming and linear programming.

d) Explain minimal spanning tree.

e) Write four different categories of simulation models.

f) Discuss the role of random number in simulation.

g) Write the limitations of Decision Trees.

h) Is the statement "The functions involved in Gradient-based optimization methods are not necessarily differentiable or continuous." true? If not, correct it.

i) What is the advantage of penalty functions? Explain with a suitable counter example.

j) Explain the terms "State" and "Stage" in DPP with a suitable example.

Part-II

Long Answer Type Questions (Answer Any five)

Q2 **a)** Solve the goal programming problem: Minimize $z = u_1 + O_1 + u_2 + O_2$, subject to $10x_1 + 12x_2 + u_1 - O_1 = 6650,\ x_1 + x_2 + u_2 - O_2 = 625,\ 2x_1 + 3x_2 \leq 1500,\ 3x_1 + 2x_2 \leq 1500;\ x_1, x_2, u_1, u_2, O_1, O_2 \geq 0.$ **(5 + 5)**

b) Find the optimum integer solution to the LPP: $Max\ z = x_1 + 4x_2$, subject to $2x_1 + 4\ x_2 \leq 7,\ 5x_1 + 3x_2 \leq 15;\ x_1, x_2 \geq 0.$ x_1, x_2 are integers by Gomory's all IPP method.

Q3 **a)** Solve the following game graphically. **(5 + 5)**

Player B

$$\text{Player A} \quad \begin{matrix} & B_1 & B_2 & B_3 & B_4 \\ A_1 & 2 & 1 & 0 & -2 \\ A_2 & 1 & 0 & 3 & 2 \end{matrix}.$$

b) Use graphical method to minimize the time added to process the following jobs on the machines shown, i.e., for each machine find the job which should be done first. Also calculate the total time elapsed to complete both the jobs:

Job 1	Sequence	A	B	C	D	E
	Time	3	4	2	6	2
Job 2	Sequence	B	C	A	D	E
	Time	5	4	3	2	6

Q4 **a)** A company manufactures 2 products; radios and transistors, which must be processed through assembly and finishing departments. Assembly has 90 hours available; finishing can handle up to 72 hours of work. Manufacturing one radio requires 6 hours in assembly and 3 hours in finishing. Each transistor requires 3 hours in assembly and 6 hours in finishing. If profit is 120 rupees per radio and 90 rupees per transistor, determine the best combination of radios and transistors to realize profit of 2100 rupees. **(5 + 5)**

b) Discuss on the major reasons for applying simulation technique to OR problems.

Q5 **a)** Differentiate the decision making: under conditions of certainty and under conditions of uncertainty. **(5 + 5)**

b) Write 3 advantages and 3 disadvantages of using simulation.

Q6 **a)** What is a maximal flow problem in networks? Illustrate with an example. **(5 + 5)**

b) Generally how many steps are involved in decision theory? Explain each step briefly.

Q7 **a)** Solve the nonlinear Programming Problem: $Min\ z = u_1^2 + u_2^2 + u_3^2$, subject to $u_1 + u_2 + u_3 \geq 100$; $u_1, u_2, u_3 \geq 0$ by DPP method. **(5 + 5)**

b) Use genetic algorithm to solve the following nonlinear programming problem:
Min $f(x_1, x_2) = (x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 - 7)^2$ subject to $0 \leq x_1, x_2 \leq 6$.

Q8 **a)** Solve the LPP: $Max\ z = 2x_1 + 5x_2$, subject to $2x_1 + x_2 \leq 430$, $2x_2 \leq 460$, $x_1, x_2 \geq 0$, by DPP method. **(5 + 5)**

b) What is a critical path? Distinguish between PERT and CPM.