BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)
B. Tech. Sem - VII Computer Science & Engineering : SUMMER : 2025
SUBJECT: OPTIMIZATION TECHNIQUES

Day : Wednesday
Date : 14/05/2025

S-25604-2025

Time : 02:30 PM-05:30 PM
Max. Marks : 60

N.B.

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Assume suitable data if necessary.
4) Use of non-programmable calculator is allowed.

Q.1 A factory manufactures three products. These products are processed through three distinct stages. The time required to manufacture a unit of each of three products and the daily capacity of the stages are given by the following table. **(10)**

Stage	Time Per Unit (min)			Stage 1
	Product 1	Product 2	Product 3	Capacity min/day
1	2	3	4	520
2	4	6	-	460
3	-	5	2	490

It is required to determine the daily number of units to be produced of each product, given that the profits per unit of product 1, 2, 3 are 3, 5, 6 respectively. Suppose that all the amounts produced are absorbed by the market. Formulate this into mathematical model.

OR

Explain limitations of Linear Programming Problems (LPP)

Q.2 Solve the following LPP : **(10)**

Maximize $Z = 3x_1 + 2x_2$

Subject to $2x_1 + x_2 \leq 2$

$3x_1 + 4x_2 \geq 12$

$x_1, x_2 \geq 0$

by using big M method.

OR

Maximize $Z = 5x_1 + 3x_2$

Subject to $3x_1 + 5x_2 \leq 15$

$6x_1 + 2x_2 \leq 24$

$x_1, x_2 \geq 0$

Converting this problem to standard form.

Q.3 Carry out at most five iterations of the following problem using method of steepest descent method. **(10)**

Assume that $X_0 = 0$ in each case.

Minimize $f(x_1 x_2) = \left(x_2 - x_1^2\right)^2 + \left(1 - x_1\right)$

P.T.O.

OR

Solve graphically the following non-linear programming problem,
Maximize $Z = x_1 + 2x_2$
Subject to
$$x_1^2 + x_2^2 \leq 1$$
$$2x_1 + x_2 \leq 2$$
and $x_1, x_2 \geq 0$

Q.4 Use dynamic programming to solve the following problem, (10)
Minimize $Z = y_1^2 + y_2^2 + y_3^2$
Subject to constraints
$y_1 + y_2 + y_3 = 10$ and $y_1 + y_2 + y_3 \geq 0$

OR

Explain all five stages involved in general algorithm of procedure of solving the problem using dynamic programming approach.

Q.5 Solve the following integer programming problem using cutting plane algorithm (10)
Maximize $Z = x_1 + x_2$
Subject to the constraints,
i) $3x_1 + 2x_2 \leq 5$
ii) $x_2 \leq 2$
$x_1, x_2 \geq 0$ and are integers.

OR

Describe classifications of integer programming problems and write ILP in its standard form in abstract form.

Q.6 What is neural network and sigmoid function? Explain computational procedure to solve crisp optimization problem. (10)

OR

Two discrete fuzzy sets A and B are defined as follows:
A= {(60, 0.1), (62, 0.5) (64, 0.7) (66, 0.9) (68, 1.0) (70, 0.8)}
B= {(60, 0.0), (62, 0.2) (64, 0.4) (66, 0.8) (68, 0.9) (70, 1.0)}
Determine union and intersection of A and B

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