Total No. of Questions : 6]

SEAT No. :

**P3872**

[Total No. of Pages : 2

# [4960] - 1071

## M.E. (Mechanical-Design Engineering)

## OPTIMIZATION TECHNIQUES

## (2013 Pattern) (Semester - III)

*Time : 3 Hours]* *[Max. Marks :50*

***Instructions to the candidates:***

1) ***Attempt any five questions.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and stream table is allowed.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

***Q1)*** a) What is the difference between linear programming and non linear programming? **[4]**

b) Explain - **[6]**

i) Feasible solution

ii) Infeasible solution

iii) Design variable

***Q2)*** A retail store stocks and sells three different models of TV sets. The store cannot afford to have an inventory worth more than Rs. 45,000 at any time. The TV sets are ordered in lots. It costs Rs. $A_j$ for the store whenever a lot of TV model j is ordered. The cost of one TV set of model j is Rs. $C_j$. The demand rate of TV model j is $D_j$ units per year. The rate at which the inventory costs accumulate is known to be proportional to the investment in inventory at any time, with $Q_j = 0.5$, denoting the constant of proportionality for TV model j . Each TV set occupies an area of $S_j = 0.40m^2$ and the maximum storage space available is $90m^2$. The data known from the past experience are given below.

***P.T.O.***

| | TV model j | | |
|---|---|---|---|
| | j=1 | j=2 | j=3 |
| Ordering cost, $A_j$ (Rs.) | 50 | 80 | 100 |
| Unit cost, $C_j$ (Rs.) | 40 | 120 | 80 |
| Demand rate, $D_j$ | 800 | 400 | 1200 |

Formulate the problem of minimizing the average annual cost of ordering and storing the TV sets. **[10]**

***Q3)*** Maximize $F = X_1 + 2X_2 + X_3$ **[10]**

Subject to

$2X_1 + X_2 - X_3 \leq 2$

$2X_1 - X_2 + 5X_3 \leq 6$

$4X_1 + X_2 + X_3 \leq 6$

$X_i \geq 0;\ i = 1, 2, 3$

Solve the problem using simplex algorithm using Tableau.

***Q4)*** a) Find minimization of the function **[7]**

$F(\lambda) = 0.65 - 0.75/(1 + \lambda^2) - 0.65\lambda \tan^{-1} 1/\lambda)$

Using Golden Section Method using n = 6

$\lambda_1 = 0.1$; Use $\varepsilon = 0.01$

b) Write a note on genetic algorithm **[3]**

***Q5)*** a) Explain ESO for stiffness optimization. **[5]**

b) Explain Powell's method of optimization. **[5]**

***Q6)*** a) Explain how topology optimization can be used as a design tool with an example. **[5]**

b) Write a note on Artificial Neural Network. **[5]**