Ref. No.: Ex/PG/ProdE/T/127B/2024

M.E. PRODUCTION ENGINEERING FIRST YEAR SECOND SEMESTER – 2024

Subject: ADVANCED TOPICS OF OPERATIONS RESEARCH (PM)

Time: Three Hours **Full Marks: 100**

Answer any Five Questions

1. a) Explain Constraint Surface and Objective Function Surfaces.
   b) State the necessary and sufficient conditions for the maximum of a multivariable function $f(X)$.
   c) Explain Saddle Point.

(8+8+4)

2. a) Explain the Working Principles of Genetic Algorithms with one flow chart.
   b) Explain the following terms: fitness function, GA operators.
   c) Differentiate Cross over & Mutation.
   d) Differentiate binary & real coded GA.

(5+5+5+5)

3. (a) Compare bracketing and region-elimination search methods.
   (b) Find the minimum of $f(x) = x^2 - (3/2)x$ in the interval of $(0.0, 1.0)$ and $\varepsilon = 10^{-1}$ using interval halving method.

(5 + 15)

4. (a) How do we get golden ratio?
   (b) Use three iterations of the golden-section search method in order to maximize the function $f(x) = 10 + x^3 - 2x - 5\exp(x)$ in the interval (-5, 5).

(5 + 15)

5. (a) Elucidate the multistage decision processes in a dynamic programming problem.
   (b) Explain the role of Boltzmann Constant in Simulated Annealing briefly.

(15 + 5)

6. (a) Solve the following LP problem using the branch-and-bound method:

Maximize $f(x) = 4x_1 + 8x_2$

Subject to:

$$4x_1 + 5x_2 \leq 40$$
$$x_1 + 2x_2 \leq 12$$
$$x_1, x_2 \geq 0, \text{ integers.}$$

   (b) What are the salient features of Gomory's cutting plane method?

(15 + 5)

7. (a) Explain with suitable diagrams the general structure of Queuing System.
   (b) Find the extreme points of the following function.
   $f(x_1, x_2) = x_1^3 + x_2^3 + 4x_1^2 + 2x_2^2 + 8.$

(10 + 10)