

2 Answer any **two** : **8×2=16**

(i) Minimise function

$$f(x) = x^2 + \frac{54}{x} \text{ by using gradient based Newton's method.}$$

(ii) Minimise function

$$f(x) = \exp \left\{ (x-0.2)^2 / 2 \right\} \text{ by using bounding phase method. Use } x^{(0)} = 0 \text{ and initial } \Delta = 1, k = 1.$$

(iii) By using golden section search method, minimise the function

$$f(x) = x^2 - 10 \exp(0.1x) \text{ in interval } (-10, 5)$$

3 Answer the following : (any **two**) **8×2=16**

(i) Find inverse of matrix

$$A = \begin{bmatrix} 3 & 7 & -2 \\ 2 & 3 & 1 \\ 5 & 1 & 6 \end{bmatrix}$$

(ii) Apply Gauss elimination method to solve following equations :

$$x + 4y - 2z = -5$$

$$x + y - 6z = -12$$

$$3x - y - z = 4$$

(iii) Write an algorithm for Marquardt's method.

SECTION - II

4 (a) Answer the following : **3×2=6**

(i) How design of shell and tube heat exchanger is different than simulation of shell and tube heat exchanger?

(ii) "Every Design Decision comes from optimization". Justify the statement.

(b) Explain Lagrangion multiplier method and KT conditions. **10**

5 Answer any two : 8×2=16

- (i) For the below given data of x & y , find a and b ; if the data have relation of the form $y = ax^b$.

x	2	3	4	5
y	27.8	62.1	112	165

- (ii) Find the root of equation $x^3 - 8x + 5 = 0$ correct to two decimal places.
- (iii) For the data given below, estimate $f(7.5)$ using Newton's Backward difference interpolation.

x	1	2	3	4	5	6	7	8
$f(x)$	1	8	27	64	125	216	343	512

6 Answer any two : 9×2=18

- (i) For a two variable problem in the simplex pattern search, equilateral triangle will be the first pattern. Generate a set of three points forming a pattern in two variable problem if one of the point is (2,3) and distance between any two point is 2.
- (ii) Write the algorithm for design of a condensor.
- (iii) List out methods for interpolation and evaluate $f(3)$ for data given below using any one method.

x	1	2	5
$f(x)$	1	4	10