SEMESTER-IV

NUERICAL METHODS-IV

(Semester-IV)

Time Allowed : Three Hours **Maximum Marks : 36**

Note : Attempt two questions each from Sections A and B carrying 5½ marks each, and the entire Section C consisting of 7 short answer type questions carrying 2 marks each.

SECTION-A

I. (a) Use Regula-Falsi method to find a real root of $x^3 - 2x - 5 = 0$ correct to four decimal places.

(b) Using Triangularisation Method solve the equations :

$2x_1 + 3x_2 + 2x_3 = 3$

$10x_1 + 3x_2 + 4x_3 = 16$

$3x_1 + 6x_2 + x_3 = -6$ (3+2½=5½)

II. (a) Find the order of convergence of Newton-Rapson method.

(b) Find a real root of the equation $x^2 - 4x - 9 = 0$ by Bisection method correct to three decimal places. (3+2½=5½)

III. (a) Find the smallest root of the equation

$$1 - x + \frac{x^2}{(2!)^2} - \frac{x^3}{(3!)^2} + \frac{x^4}{(4!)^2} - \ldots\ldots = 0.$$

(b) Solve the following system of equations by Gauss Seidel method

$5x + 2y + z = 12$

$x + 4y + 2z = 15$

$x + 2y + 5z = 20$ (3+2½=5½)

IV. (a) Find the order of convergence of Regula Falsi method.

(b) Find a root of equation $x^3 - x - 10 = 0$ using Secant method. (3+2½=5½)

SECTION–B

V. (a) State and proof Newton-Gregory backward formula.

(b) Find the polynomial f(x) by using Lagrange's formula and hence find f(3) for

X	:	0	1	2	5
f(X)	:	2	3	12	147

(3+2½=5½)

VI. (a) Find a polynomial using Bessel's interpolation from the table below :

X	:	2	3	4	5
f(X)	:	7	9	12	16

(b) Using Newton's forward interpolation formula show that

$$\sum n^3 = \left\{\frac{n(n+1)}{2}\right\}^2$$ (3+2½=5½)

VII. (a) State and proof Lagrange's Interpolation formula

(b) Using Everett's formula to evaluate f(30)

If f(2) = 2854, f(28) = 3162, f(36) = 7088, f(44) = 7984. (3+2½=5½)

VIII. (a) Using Sterling formula, find y_{35} given that

$y_{20} = 512$, $y_{30} = 439$, $y_{40} = 346$, $y_{50} = 243$.

(b) Use Newton backward formula to estimate the number of students who obtained marks between 20 and 25

Marks :	10	20	30	40	50
No. of Students :	20	45	115	210	325

(3+2½=5½)

SECTION–C
(Compulsory Question)

IX. Attempt all the questions :

(a) Obtain the function whose first difference is $9x^2 + 11x + 5$.

(b) Using Lagrange's interpolation formula, express the function $\frac{x^2+x+3}{x^3-2x^2-x+2}$ as sum of partial fractions.

(c) Solve the following system of equation by Gauss elimination method

$3x + 4y + 5z = 40$

$2x - 3y + 4z = 13$

$x + y + z = 9.$

(d) Mention the drawbacks of Newton Rapson method

(e) Using iteration method, find a root of the equation $x^3 + x^2 - 1 = 0$ correct to four decimal places

(f) Evaluate $\Delta^2(\cos 2x)$.

(g) Find the iteration formula for finding $\frac{1}{N}$ for some positive real number N using Newton-Rapson method. (7×2=14)