PC-4361/MH

B/2051

NUMERICAL METHODS–IV (i)

(Semester–IV)

Time : Three Hours] [Maximum Marks : 40

Note : Attempt *five* questions in all selecting *two* questions each from Section A and Section B and compulsory question of Section C.

SECTION–A

I. (a) Find a real root, correct to three decimals, of the equation $x^3 - x - 4 = 0$ by using the bisection method. 3

(b) Find a root of the equation $x^3 - 2x - 5 = 0$ using the secant method correct to three decimal places. 3

II. (a) Show that Newton-Raphson method has a quadratic convergence. 3

(b) Find the smallest root of the following equation

$$1 - x + \frac{x^2}{(2!)^2} - \frac{x^3}{(3!)^2} + \frac{x^4}{(4!)^2} - \frac{x^5}{(5!)^2} + \ldots\ldots = 0$$

3

III. Apply Gauss Seidel method to solve the following system of equations :

$27x + 6y - z = 85$

$x + y + 54z = 110$

$6x + 15y + 2z = 72.$ 6

IV. Using Triangularization method solve :

$2x + 3y + z = 9$

$x + 2y + 3z = 6$

$3x + y + 2z = 8.$ 6

SECTION–B

V. (a) Apply Bessel's formula to obtain y_{25} given that :

$y_{20} = 2854$, $y_{24} = 3162$, $y_{28} = 3544$, $y_{32} = 3992$ 3

(b) From the following table :

x	20	25	30	35	40
$f(x)$	11.4699	12.7834	13.7648	14.4982	15.0463

Find $f(34)$ using Everett's formula. 3

VI. From the following table, estimate the number of students who obtained marks between 40 and 45 :

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

VII. A curve passes through the points (0, 18), (1, 10), (3, –18) and (6, 90). Find the slope of the curve at $x = 2$. 6

VIII. (a) For the following table, find $f(x)$ as a polynomial in x using Newton's Divided difference formula : 3

x	5	6	9	11
$f(x)$	12	13	14	16

(b) Prove that $\nabla y_{n+1} = h\left(1 + \frac{1}{2}\nabla + \frac{5}{12}\nabla^2 + \ldots\ldots\right) y_n$. 3

SECTION–C

IX. (a) Develop an algorithm using Newton-Raphson method, to find the fourth root of a positive number N.

(b) What is partial and complete pivoting?

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

(d) Solve the following system of equations by Gauss Elimination method :

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

(e) Show that nth divided difference of a polynomial of the nth degree are constant.

(f) Show that $\Delta = E\nabla = \nabla E = \delta E^{\frac{1}{2}}$.

(g) Using Newton's forward formula, find the value of $f(1.6)$, if

x	1	1.4	1.8	2.2
$f(x)$	3.49	4.82	5.96	6.5

(h) Find the missing term in the following table:

x	2	3	4	5	6
y	45.0	49.2	54.1	?	67.4

(2×8=16)