

Roll No. _____

PGIIS-N 1530 B-2K13

M.A./M.Sc. IIIrd Semester (CBCS) Degree Examination

Mathematics

(Computational Numerical Methods-I)

Paper - HCT-3.3

(New)

Time : 3 Hours

Maximum Marks :80

Instructions to Candidates:

- i) Answer any **five** questions
- ii) All questions Carry **equal** marks.

1. a) Derive the Hermite interpolating polynomial. (8)
- b) Construct the Hermite interpolation polynomial that fits the data.

x	0	0.5	1.0
$f(x)$	0	0.4794	0.8415
$f'(x)$	1	0.8776	0.5403

(8).

Estimate the value of $f(0.25)$ and $f(0.75)$

2. a) Obtain the piecewise quadratic interpolating polynomial for the function $f(x)$ defined by the data

x	-3	-2	-1	1	3	6	7
$f(x)$	369	222	171	165	207	990	1779

Hence find an approximate value of $f(-2.5)$ and $f(6.5)$ (8)

- b) Using the chebyshev polynomials, obtain the least squares approximation of second degree for $f(x) = x^4$ on $[-1,1]$. (8)
3. a) Describe Newton -Raphson method for solving the system of two non-linear equations with two unknowns. (8)
- b) Apply Newton-Raphson method for solving $x^2 + y^2 - 4 = 0$
 $xy - 1 = 0$
with $(x_0, y_0) = (2,0)$. Perform two iterations. (8)

4. a) Describe Bairstow method to extract a quadratic factor (x^2+px+q) from the polynomial $P_n(x) = a_0x^n + a_1x^{n-1} + \dots + a_{n-1}x + a_n$ and $a_0 \neq 0$ (8)
- b) Perform two iterations of Bairstow method to extract a quadratic factor $(x^2 + px + q)$ from the polynomial $x^3 + x^2 - x + 2 = 0$. Use the initial approximation $p_0 = -0.9$ and $q_0 = 0.9$. (8)
5. a) Describe Gauss-elimination method for solving system of three equations with three unknowns. (8)
- b) Solve the system of equations
- $$\begin{aligned} x_1 + x_2 + x_3 &= 1 \\ 4x_1 + 3x_2 - x_3 &= 6 \\ 3x_1 + 5x_2 + 3x_3 &= 4 \end{aligned}$$
- by Gauss-Jordan method (8)
6. a) Describe Jacobi's iteration method for solving the system of n-linear equations with n-unknowns. (8)
- b) Solve the following system of equations by using Jacobi's iteration method.
- $$\begin{aligned} 4x_1 + x_2 + x_3 &= 2 \\ x_1 + 5x_2 + 2x_3 &= -6 \\ x_1 + 2x_2 + 3x_3 &= -4 \end{aligned}$$
- Take the initial approximation as $x^{(0)} = [0.5, -0.5, -0.5]^T$ and perform three iterations. (8)
7. a) Describe Gauss-Jordan method of matrix inversion (8)
- b) Find the inverse of the following matrix by Jordan method. $A = \begin{bmatrix} 2 & 6 & 6 \\ 2 & 8 & 6 \\ 2 & 6 & 8 \end{bmatrix}$ (8)
8. a) Describe Jacobi's method to find all the eigen values and eigen vectors of a real symmetric matrix. (8)
- b) Find the eigen values and the eigen vectors of the matrix $A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 1 & 2 \\ 4 & 2 & 2 \end{bmatrix}$ by Givans method. (8)