

(4)

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- (b) Determine the largest Eigen value and the corresponding eigen vector of the matrix.

$$A = \begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$$

Unit-4

8. (a) Using Runge-Kutta method, compute $y(0,2)$ and $y(0,4)$ from

$$\frac{dy}{dx} = 3x + \frac{1}{2}y, y(0) = 1$$

- (b) Given $\frac{dy}{dx} = x^2(1+y)$,

$$y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548,$$

$$y(1.3) = 1.979$$

Evaluate $y(1.4)$ by using Milne's method.

9. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown

| | | | | |
|------|-----|------|-----|-------|
| 0 | 500 | 1000 | 500 | 0 |
| 1000 | | | | 1000 |
| 2000 | | | | 2,000 |
| 1000 | | | | 1,000 |
| 0 | 500 | 1000 | 500 | 0 |

22605

M. Tech. 1st Semester (ME) CBCS Scheme Examination,
December-2018

NUMERICAL METHODS AND COMPUTING

Paper-MTME21D1

Time allowed : 3 hours]

[Maximum marks : 100

Note : Q. No. 1 is compulsory. Attempt total 5 questions with selecting one question from each unit. All questions carry equal marks.

- (a) Round off the following numbers correct to four significant figures and find relative error :
3.26245, 35.46735, 0.70035, 18.265101,
0.859378

(b) Find by Taylor's series method, the value of y at $x = 0.1$ and $x = 0.2$ from $\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$

(c) Express $1 + x - x^4$ as a sum of Chebyshev polynomials.

(d) Define the terms Interpolation and Extrapolation.

(e) Discuss initial value problems and B.V.P's.

(f) Define Eigen values and Eigen vectors.

(g) What is spline interpolation ?

(h) How are the partial differential equations classified ? Give an example for each type.

Unit-1

2. (a) Given that
 $a = 10.00 \pm 0.05$
 $b = 0.0356 \pm 0.0002$
 $c = 15300 \pm 100$
 $d = 6200 \pm 100$
 find the maximum value of the absolute error in
 (i) $a+b+c+d$
 (ii) $a+5c-d$
 (iii) c^3
- (b) Find the relative error in the function
 $Y = ax_1^{m1} x_2^{m2} \dots x_n^{mn}$
3. (a) Find the cubic splines to fit data and evaluate
 $y(1.5)$ and $y'(3)$
 $x: 1 \quad 2 \quad 3 \quad 4$
 $y: 1 \quad 2 \quad 5 \quad 11$
- (b) Determine $f(x)$ as a polynomial in x for the
 following data:
 $x: -4 \quad -1 \quad 0 \quad 2 \quad 5$
 $f(x): 1245 \quad 33 \quad 5 \quad 9 \quad 1335$
 by using Divided Diff. Table. Hence evaluate $f(1)$

Unit-2

4. (a) Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ using
 (i) Trapezoidal rule taking $h = \frac{1}{4}$
 (ii) Simpson's rule taking $h = \frac{1}{6}$

- (b) Find $f'(10)$ from the following data :

| | | | | | |
|---------|-----|----|-----|-------|-------|
| $x:$ | 3 | 5 | 11 | 27 | 34 |
| $f(x):$ | -13 | 33 | 899 | 17315 | 35606 |

5. (a) Find a real root of the equation $3x = \cos x + 1$ by
 Secant method to four decimal places.
 (b) Solve the non linear equation $x \log_{10} x = 1.2$ by
 Newton Raphson Method.

Unit-3

6. (a) Solve the system
 $54x + y + z = 110$
 $2x + 15y + 6z = 72$
 $-x + 6y + 27z = 85$
 by using iterative method.
- (b) Solve the equations :
 $2x + y + z = 10;$
 $3x + 2y + 3z = 18;$
 $x + 4y + 9z = 16$
 by Gauss elimination method.
7. (a) Determine Eigen value and the corresponding
 Eigen vector of the matrix by Jacobi Method

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$