

# CBCS SCHEME

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15AE753

## Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019 Numerical Methods

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing  
ONE full question from each module.

### Module-1

- 1 a. Convert the following :
- $(156.625)_{10}$  into binary
  - $(3F8.01)_{16}$  into decimal.
- (04 Marks)
- b. Explain machine precision and write an algorithm to determine machine epsilon. (08 Marks)
- c. Round off the value of ' $\pi$ ' to 4 significant digits and determine the absolute and relative error. (04 Marks)

OR

- 2 a. Explain how a linear system of equation is solved by LU decomposition method. (04 Marks)
- b. Solve the given system of equations using Jacobi iteration method. Take the initial approximation as  $x^0 = [0.5, -0.5, -0.5]^T$ .
- $$4x_1 + x_2 + x_3 = 2$$
- $$x_1 + 5x_2 + 2x_3 = -6$$
- $$x_1 + 2x_2 + 3x_3 = -4.$$
- (12 Marks)

### Module-2

- 3 a. Given  $f(2) = 4$ ,  $f(2.5) = 5.5$ , find the linear interpolating polynomial using i) Lagrange interpolation and ii) Newton's divided difference interpolation and find an approximate value of  $f(2.2)$ . (08 Marks)
- b. For the following data, calculate the differences and obtain the forward and backward difference polynomials. Interpolate at  $x = 0.25$  and  $x = 0.35$ .

x	0.1	0.2	0.3	0.4	0.5
f(x)	1.4	1.56	1.76	2	2.28

(08 Marks)

OR

- 4 a. Determine the eigen values and eigen vectors of the given matrix :

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

(10 Marks)

- b. Explain how the largest eigenvalue and the corresponding eigenvector of a matrix is determined using power method. (06 Marks)

**Module-3**

- 5 a. Given the following values of  $f(x) = x^4$ , find the approximate value of  $f'(0.6)$  using forward difference, backward difference and central difference formula. Also find  $f''(0.6)$ .

x	0.4	0.6	0.8
f(x)	0.0256	0.1296	0.4096

(08 Marks)

- b. Find the approximate value of  $\int_0^1 \sin x \, dx$  using trapezoidal rule by dividing the interval into three equal subintervals.

(08 Marks)

OR

- 6 Evaluate the integral  $I = \int_1^2 \int_1^2 \frac{dx dy}{(x+y)}$  using the trapezoidal rule with  $h = k = 0.5$  and  $h = k = 0.25$ .

(16 Marks)

**Module-4**

- 7 Determine the cubic spline from the following table and hence find  $y(2.5)$ ,  $y'(0.5)$  and  $y''(2)$ .

x	1	2	3	4
y	1	2	5	11

(16 Marks)

OR

- 8 a. Obtain the linear polynomial approximation to the function  $f(x) = x^3$  on the interval  $[0, 1]$  using the least squares approximation with  $w(x) = 1$ . (12 Marks)
- b. Write few objectives of studying curve fitting. (04 Marks)

**Module-5**

- 9 a. Solve the given equation  $x^3 + x - 1 = 0$  using secant method. (08 Marks)
- b. Explain Newton's method in detail with the help of a diagram. (08 Marks)

OR

- 10 a. Explain local and global minima in detail. (06 Marks)
- b. Describe steepest descent method in detail. (10 Marks)

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