

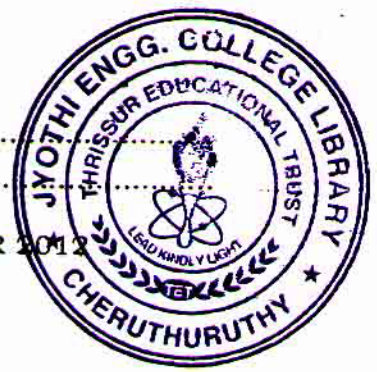
Name :

Reg. No:

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, OCTOBER 2017

Computer Science & Engineering

CS 09 L24 - COMPUTER BASED NUMERICAL METHODS



Time : Three Hours

Maximum : 70 Marks

PART A

(Answer ALL questions: 5 x 2 marks = 10 marks)

1. What is inherent error?
2. Define the rate of convergence of an iterative method.
3. What is the difference between Stirling and Bessel interpolation?
4. What is weight function as used in numerical integration?
5. Define a cubic spline.

PART B

(Answer any four questions: 4 x 5 = 20 marks)

6. Explain the Newton Raphson method.
7. Determine the appropriate step size to use in the construction of a table of $f(x) = (1+x)^6$ on $[0,1]$. The truncation error for linear interpolation is to be bounded by 5×10^{-5}
8. What is the relation between Bessel's and Everett's formulae?
9. Explain the trapezoidal rule for numerical integration.
10. Explain the method of least squares as a curve fitting procedure.
11. Explain the use of frequency chart.

PART C

(Answer section (a) or section (b) of each question: 4 x 10 = 40 marks)

12. (a) Discuss the propagation of error for the following:

- i) The sum of three numbers

$$p + q + r = (\bar{p} + \varepsilon_p) + (\bar{q} + \varepsilon_q) + (\bar{r} + \varepsilon_r)$$

- ii) The quotient of three numbers

$$\frac{p}{q} = \frac{\bar{p} + \varepsilon_p}{\bar{q} + \varepsilon_q}$$

- iii) The product of three numbers

$$pqr = (\bar{p} + \varepsilon_p)(\bar{q} + \varepsilon_q)(\bar{r} + \varepsilon_r)$$

Where p, q, r are the true values, $\bar{p}, \bar{q}, \bar{r}$ are the approximate values with errors $\varepsilon_p, \varepsilon_q, \varepsilon_r$ respectively

OR

(b) Perform two iterations with the Muller method for the equation $\log x - x + 3 = 0$ with $x_0 = 1/4, x_1 = 1/2, x_2 = 1$

13. (a) 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)	1.40	1.56	1.76	2.00	2.28

OR

(b) Deduce the equation for Lagrange's interpolation.

14. (a) For the method $f'(x_0) = \frac{-3f(x_0) + 4f(x_1) - f(x_2)}{2h} + \frac{h^2}{3} f'''(\xi)$ where

$x_0 < \xi < x_2$ determine the optimum value of h using the criteria

- $|RE| = |TE|$
- $|RE| + |TE| = \text{minimum}$

Where RE is the round off error and TE is the truncation error.

OR

(b) Derive the relations for Simpson's 1/3 rule. Find the error associated with this method.

15. (a) Obtain the best lower degree approximation to the cubic $x^3 + 2x^2$

OR

(b) How can we use the method of least squares to estimate the regression coefficients in multiple regression?