

29/05/13



COMP 3 – 4 (RC)

S.E. (Comp.) Sem. – III (RC) Examination, May/June 2013 COMPUTER ORIENTED NUMERICAL TECHNIQUES

Duration : 3 Hours

Total Marks : 100

Instructions : i) Answer **any 5** questions, atleast **one** from **each** Module.
ii) **Assume** suitable data **if** necessary.

Module – I

1. a) If $\pi = \frac{22}{7}$ is approximated as 3.14, find absolute, relative and percentage error. 4
- b) Use bisection method to find out the positive square root of 30, correct to 4 decimal places. 6
- c) Find the real root of $x \sin x + \cos x = 0$, correct to 3 decimal places using Newton Raphson method. Provide an algorithm for this method. 10
2. a) What is the difference between partial and complete pivoting ?
Solve the following system of equations using Gauss elimination with partial pivoting :

$$x + y + z = 7$$

$$3x + 3y + 4z = 24$$

$$2x + y + 3z = 16.$$
8
- b) Give an example of ill-conditioned system. 4
- c) Solve the system of equations by Gauss Jordan method :

$$10p + q + r = 12$$

$$2p + 10q + r = 13$$

$$p + q + 5r = 7.$$
8

P.T.O.



Module – II

3. a) Given the data :

x : 1.2 1.3 1.4 1.5

$f(x)$: 1.063 1.091 1.119 1.145

Calculate $f(1.35)$ using Newton's interpolating polynomial of order 1 through 3.

8

- b) Define an interpolation function. Derive Lagrange's interpolation polynomial of degree n .

6

- c) Construct divided difference table for given data :

6

x : 0.1 0.3 0.5 0.7 0.9 1.1 1.3

$f(x)$: 0.003 0.067 0.148 0.248 0.370 0.518 0.697

4. a) Give an algorithm for solving a system of linear equations using Jacobi iteration method.

5

- b) What are the limitations of using direct method of solving a system of linear equations ?

3

- c) Solve the following system of linear equations using Jacobi iteration and Gauss seidel method.

12

$$2x - 7y - 10z = -17$$

$$5x + y + 3z = 14$$

$$x + 10y + 9z = 7$$

Module – III

5. a) What do you understand by boundary value problem ? Solve the boundary value problem,

$$y''(x) = y(x) ; y(0) = 0, y(1) = 1.1752 \text{ by shooting method, taking } m_0 = 0.8 \text{ and } m_1 = 0.9.$$

10

- b) A rod is rotating in a plane. The following table gives the angle θ (in radians) through which the rod has turned for various values of time t (in seconds)

t : 0 0.2 0.4 0.6 0.8 1.0 1.2

θ : 0 0.12 0.49 1.12 2.02 3.20 4.67

Calculate the angular velocity and angular acceleration of rod at $t = 0.6$ sec. and $t = 1.0$ sec.

10



6. a) Derive Newton-Cotes quadrature formula. 7
- b) Evaluate $\int_{0.6}^2 y \cdot dx$ using trapezoidal rule. Divide the interval into 7 equal parts. 6
- c) Find $\int_0^6 \frac{e^x}{1+x} \cdot dx$ using Simpson's 3/8th rule of integration. Take $h = 1$. 7

Module – IV

7. a) State the formula for Euler's method. Illustrate the concept graphically. 4
- b) Solve $\frac{dy}{dx} = x^2y - y$ and $y(0) = 1$ using Picards method and estimate y at $x = 0.25$ and $x = 0.5$. 8
- c) Illustrate 4th order Runge Kutta method. Estimate $y(0.4)$ when $y'x = x^2 + y^2$ with $y(0) = 0$. Assume $h = 0.2$. 8
8. a) Derive Laplace equation. 8
- b) What are partial differential equations ? How are they classified ? 6
- c) Determine which of the following equations are elliptic, parabolic and hyperbolic.
- i) $f_{xx} + 6f_{xy} + 9f_{yy} = 0$
 - ii) $f_{xx} - f_{yy} = 0$
 - iii) $f_{xy} - f_y = 0$
 - iv) $f_{xx} + 2f_{xy} + 4f_{yy} = 0$. 4
- d) Differentiate between parabolic and elliptic equations. 2