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S.E. (Computer) (Semester- III) (Revised Course 2007-08)
EXAMINATION Nov/Dec 2019
Computer Oriented Numerical Techniques

[Duration : Three Hours]

[Total Marks : 100]

Instructions: Answer at least one from each Module and five questions in all.

MODULE I

1.
 - a) Write algorithm for bisection method 5
 - b) Using Bisection method find negative roots of $x^3 - 4x + 9 = 0$. Correct your answer upto three decimal places. Show stepwise computation and also comment on rate of convergence of Bisection method. 8
 - c) Use Gauss Jordan Method to solve following system of equations: 7
 $2x_1 + 4x_2 - 6x_3 = -8$
 $x_1 + 3x_2 + x_3 = 10$
 $2x_1 - 4x_2 - 2x_3 = -12$
2.
 - a) Use Secant Method to find positive root of $\cos x - x \cdot e^x = 0$ Correct answer upto four decimal places. 6
 - b) Solve the full system using Gauss elimination method: 8
 $x_1 + x_2 + x_3 = 6$
 $3x_1 + 3x_2 + 4x_3 = 20$
 $2x_1 + x_2 + 3x_3 = 13$
 - c) Use false position method to find the roots of equation $x \log_{10} x = 1.2$ correct to two decimal places. 6

MODULE-II

3.
 - a) Obtain the solution of following system using Gauss-Seidal Iteration Method. 6
 $2x_1 + x_2 + x_3 = 5$
 $3x_1 + 5x_2 + 2x_3 = 15$
 $2x_1 + x_2 + 4x_3 = 8$
 - b) Determine by Lagrange's method, the percentage number of patients over 40yrs. 7

Ageover(x)years	30	35	45	55
%No. of(y)of patients	148	96	68	34

- c) Find the cubic polynomial which takes the following values. Hence evaluate f(4) 7

X	0	1	2	3
F(x)	1	2	1	10

4. a) Solve the following system of equations using Jacobi's Iteration method. 7
 $20x + y - 2z = 17$
 $3x + 20y - z = 18$
 $2x - 3y + 20z = 25$

- b) Find Eigen Value and its corresponding Eigen Vector of the following matrix. 6
 Take X=[100] where is Initial Eigen Vector

$$A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$$

- c) By any suitable method, find y at x=10; given the following table. 7

x	5	8	11	21
y	12	13	14	16

MODULE-III

5. a) Write C/C++ program to implement trapezoidal rule for numerical Integration. 6
 b) Derive composite trapezoidal formula. 6
 c) Evaluate $I = \int_0^1 \frac{1}{1+x^2} dx$ Using Simpson 1/3rd rule when n=6. 8
6. a) Evaluate the integral $I = \int_1^2 \frac{1}{x} dx$ using Romberg's method, $h = 0.5, 0.25, 0.125$. 6
 b) Evaluate $\int_4^{5.2} \text{Log}_e x \cdot dx$ using simpsons 3/8 rule by dividing the interval into 6 equal parts. 7
 c) Solve the differential equation using shooting method. 7
 $d^2y/dx^2 = 12x^2, y(1) = 2, y(2) = 17$

MODULE-IV

7. a) Use the Runge-Kutta method to estimate y at x=0.5 of the following equation with $h = 0.25$, given $\frac{dy}{dx} = y + \sin(x), y(0) = 2$. 7
 b) Write short note on parabolic equation. 5

8. c) Solve using Picard's method and estimate y at $x = 0.25, 0.50$, given $\frac{dy}{dx} = x^2y^2, y(1) = 0$ **8**
- a) Write note on elliptic equation **5**
- b) Given equation $\frac{dy}{dx} = \frac{2y}{x}$, with $y(1) = 2$, estimate y at $x = 2$ using Euler's Predictor-Corrector method. **8**
- c) Using Taylor method, compute $y(0.1)$ and $y(0.2)$ given, $\frac{dy}{dx} = 3x^2 + 2y, y(0) = 2$ **8**