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COMP – 3-4 (RC)

S.E. (Comp.) (Semester – III) (RC) Examination, May/June 2015
COMPUTER ORIENTED NUMERICAL TECHNIQUES

Duration : 3 Hours | Total Marks : 100

Instruction : *Attempt **any five** questions by selecting atleast **one** question from **each** Module.*

MODULE – 1

1. a) Using Bisection Method find the smallest positive root of $3x^3 + 2x^3 - 7 = 0$, correct to two decimal places. **8**

   b) What are transcendental equations ? How are they different from algebraic equations ? **5**

   c) Use Gauss-Jordan's Method to find inverse of Matrix $A = \begin{bmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & 2 & 1 \end{bmatrix}$. **7**

2. a) Develop an algorithm, flowchart and write a program to find the root of a non linear equation by Secant Method. **10**

   b) Find the cube root of 24, correct to three decimal places by Newton Raphson's Method. **6**

   c) Explain various sources of errors in numerical computing. **4**

MODULE – 2

3. a) The following data gives marks obtained by 100 students in a subject for an examination. Use Newton's Backward Interpolation formula, to find number of students who have scored 45 marks and above.

Marks	30-40	40-50	50-60	60-70	70-80
No. of Students	25	32	22	11	07

7

b) Find the largest eigen value and corresponding eigen vector of Matrix

$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. 6

c) Use Stirlings formula to compute f(12.2)

x	10	11	12	13	14
y	0.23967	0.28060	0.31788	0.35209	0.38368

7

4. a) Determine f(x) as a polynomial in x for the following data :

x	4	-1	0	2	5
f(x)	1245	33	5	9	1335

7

b) Using Newton's Divided Difference Interpolation formula, compute y at x = 5.2 given

x	1	2	4	6	7
y	32	64	98	115	132

7

c) Use Jacobi's method to solve :

$2x_1 + x_2 + x_3 = 5$

$3x_1 + 5x_2 + 2x_3 = 15$

$2x_1 + x_2 + 4x_3 = 8$. 6

MODULE – 3

5. a) Derive Newton-Cotes quadrature formula. 7

b) Use Simpson's $3/8^{th}$ rule to evaluate $\int_1^3 \frac{x}{\sin x \cdot e^x}\, dx$ taking 6 intervals. 6

c) Write a program to implement Simpsons $1/3^{rd}$ rule. 7

6. a) Evaluate $\int_0^1 \frac{1}{1+x^2}\,dx$ numerically using Trapezoidal rule by taking h = 0.5 and 0.25. Use Romberg's Method to improve the result. 7

b) Use Shooting method to solve the following differential equation.

$\frac{d^2y}{dx^2} + \frac{2dy}{dx} - y/2 - 2.5 = 0$ y(0) = 10 and y(10) = 6. 7

c) State Simpson's $1/3^{rd}$ rule, derive its total error. 6

MODULE – 4

7. a) Write a program to implement Euler's method. 7

b) Use R K method to estimate y at x = 0.5 given $\frac{dy}{dx} = x/y$, y(0) = 1. 6

c) Solve $\frac{dy}{dx} = x + y^2 + 1$, y(0) = 0 using Picard's Method, Hence compute y at x = 0.1, 0.2. 7

8. a) Draw a flow chart to implement RK method. 6

b) Use Euler's Predictor Corrector formula to compute y(0.2) and y(0.3) given that $dy/dx = y^2 + xy$, y(0) = 1. 7

c) State if the following piece wise polynomials are splines or not

$f_1(x) = x + 1 \quad -1 \le x < 0$

$f_2(x) = 2x + 1 \quad 0 \le x < 1$

$f_3(x) = 4 - x \quad 1 \le x \le 2$ 7