[Total No. of Questions : 8]

S.E. (Comp.) (Semester - III) Examination, May 2011
COMPUTER ORIENTED NUMERICAL TECHNIQUES

Duration : 3 Hours **Total Marks : 100**

Instructions : *1) Attempt any five questions. At least one from each module.*
2) Assume suitable data, if necessary.

MODULE - I

Q1) a) Find a positive root of $3x^2 - \sqrt{2+\cos x} = 3$ correct to three decimal places by Secant method. (x is measure in radians). **[8]**

b) What do you mean by order of Convergence? Prove that Newton-Raphson method has second order convergence. **[5]**

c) Using Bisection method find the root of $x^3 = 5x - 3$ between 1 and 2 correct to 2 decimal places. **[7]**

Q2) a) Develop an algorithm and write the program in C to find the root of the equation in 1 c) by Regula Falsi Method. **[10]**

b) Using Gauss-Elimination Method by partial pivoting, solve the system of equations **[10]**

$3.15x - 1.96y + 3.85z = 12.95$

$2.13x + 5.12y - 2.89z = -8.61$

$5.92x + 3.05y + 2.15z = 6.88$

MODULE - II

Q3) a) Define the difference operators Δ, ∇ and δ and show that $\delta^2 = \Delta - \nabla = \Delta\nabla$. **[6]**

b) A polynomial function $f(x)$ is defined by the following set of function values. **[8]**

x	1	3	5	7	9	11	13
$f(x)$	3	31	69	131	351	834	921

Use appropriate interpolation formula to estimate $f(2)$ and $f(12)$.

c) By means of divided Newton's divided difference formula find the interpolating polynomial that approximates the function given by the following table. **[6]**

x	0	1	2	4	5	6
F(x)	-4	-2	4	52	106	188

Q4) a) Develop an algorithm, draw the flow chart and write the C program for implementing Lagrange's interpolation formula. **[12]**

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b) Using Gauss-Seidal method solve the following system of linear equations $x + y + 50z = 110$, $32x + 6y - z = 85$, $6x + 35y + 2z = 72$. The result should be correct to four significant digits. **[8]**

MODULE - III

Q5) a) From the following table, find f′(2) **[7]**

x :	1	1.5	2.0	2.5	3.0	3.5
$f(x)$:	11.409	8.619	5.903	7.139	2.3756	9.627

b) Derive the local error and the global error of Simpson's 1/3rd rule. **[7]**

c) Evaluate $\int_0^2 e^{x^2} \sin 2x dx$ by trapezoidal rule. Take step size $h = 0, 2$. **[6]**

Q6) a) Evaluate $\int_0^2 \frac{e^{2x}}{3x^2+2} dx$ by trapezoidal rule taking $h = 0.2$ and $h = 0.4$. Use Romberg method to improve the result. **[8]**

b) Develop an algorithm and write the C program to implement Simpson's 1/3rd rule. **[12]**

MODULE - IV

Q7) a) Given $\frac{dy}{dx} = 2e^{2x} + y^2$ $y(0) = 1$, Find $y(0.1)$ and $y(0.2)$ correct to two decimal places using Euler's Predictor Corrector method. **[8]**

b) Use Picard's method to compute $y(0.1)$ and $y(0.2)$ given that $\frac{dy}{dx} = 2x^2 + 3y$ $y(0) = 2$. **[6]**

c) Draw a flow chart to implement Runge-Kutta second order method to solve the initial value problem $\frac{dy}{dx} = f(x, y)$, $y(x_0) = y_0$ **[6]**

Q8) a) Given $\frac{dy}{dx} = \frac{3x+1}{y^2+2x}$ $y(1) = 2$, evaluate $y(1.1)$ and $y(1.2)$ using Fourth order Runge-Kutta Method. Take step size $h = 0.1$. **[8]**

b) Develop an algorithm a C-Program to implement the problem (8a). **[12]**