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NCS-303

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : **110309**

Roll No.

B. Tech.

(SEM. III) (ODD SEM.) THEORY EXAMINATION, 2014-15

COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES

Time : **2** Hours] [Total Marks : **50**

Note : Attempt all questions.

1 Attempt **any four** parts of following : **4×3=12**

(a) Define 'Absolute error' and 'Relative error'. An approximate value of π is given by 3.1428571 and its true value is 3.1415926. Find absolute and relative errors.

(b) Find the rate of convergence of fixed point iteration method.

(c) The equation $f(x) = 3x^3 + 4x^2 + 4x + 1 = 0$ has a root in interval [-1, 0]. Find this root with an accuracy of 10^{-4} using iteration method.

(d) Use synthetic division and perform 2 iterations of the Birge – Vieta method to find smallest positive root of the polynomial $P_3(x) = 2x^3 - 5x + 1 = 0$. Use $P_0 = 0.5$.

(e) Perform two iteration of the linear iteration method followed by one iteration of the Aitken Δ^2 method to find the root of the equation $f(x) = x - e^{-x} = 0$, $x_0 = 1$.

(f) Write down the algorithm for Secant method.

2 Attempt **any four** parts of following : **4×3=12**

(a) Calculate f(3) using Newton-divided difference formula from the following data :

X	0	1	2	4	5	6
f	1	14	15	5	6	19

(b) Find an interpolating polynomial to the following data :

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

(c) Prove the following

(a) $\delta = E^{1/2} + E^{-1/2}$

(b) $\nabla = 1 - E^{-1}$

(d) Express $1 - x^2 + 2x^4$ as sum of Chebyshev polynomials.

(e) Obtain the least squares straight line fit to the following data :

X	0.2	0.4	0.6	0.8	1
f(x)	0.447	0.632	0.775	0.894	1

(f) What do you mean by Gram-Schmidt Orthogonalization process ?

3 Attempt **any two** parts of following : **2×7=14**

(a) Find f'(1.3) and f''(1.3) from the following table :

X	1.0	1.2	1.4	1.6	1.8	2
f(x)	0.0	0.1280	0.5540	1.2960	2.4320	4.0

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using

(a) Trapezoidal rule

(b) Simpson's 3/8 rule.

(c) Evaluate the integral $\int_0^1 \frac{dx}{2x^2+2x+3}$ using Lobatto and Radau 3-point formula.

4 Attempt **any two** parts of following : **2×6=12**

(a) Solve $10x - 7y + 3z + 5u = 6$, $-6x + 8y - z - 4u = 5$, $3x + y + 4y + 11u = 2$ and $5x - 9y - 2z + 4u = 7$ by Gauss Elimination method.

(b) Using Runge - Kutta method of 4^{th} order, find the numerical solution at $x = 1.2$ and $x = 1.4$ for the differential equation $\frac{dy}{dx} = \frac{x^2 + y^2}{xy}$, with $y(1) = 3$.

(c) Find $y(2)$ if $y(x)$ is the solution of $\frac{dy}{dx} = \frac{1}{2}(x + y)$ where $y(0) = 2$, $y(0.5) = 2.636$, $y(1) = 3.595$ and $y(1.5) = 4.968$ using Milne's predictor-corrector formula.