M.C.A. DEGREE II SEMESTER EXAMINATION APRIL 2013

CAS 2204 APPLIED NUMERICAL ANALYSIS

(*Regular and Supplementary*)

Time: 3 Hours | Maximum Marks: 50

PART A

(Answer *ALL* questions)

$(15 \times 2 = 30)$

I. (a) Describe interval halving method and write its algorithm.
(b) Explain Newton's method and write its algorithm.
(c) Describe fixed point iteration method for finding a root of the equation $f(x) = 0$.

II. (a) Give examples of consistent and inconsistent systems of equations.
(b) Explain matrix inversion method.
(c) Define condition number. Explain its uses.

III. (a) Write an algorithm for constructing divided difference table.
(b) Explain cubic spline interpolation.
(c) Explain the method of least-square approximation.

IV. (a) Explain trapezoidal rule.
(b) Describe Simpson's 1/3 rule.
(c) Explain adaptive integration.

V. (a) Explain Taylor series method.
(b) Explain Milne's method.
(c) Write a note on error propagation.

PART B

$(5 \times 4 = 20)$

VI. A. Using Muller's method find a root of the equation $\tan x - x - 1 = 0$ near $x = 1.1$.

OR

B. Find the quadratic factors of $x^4 - 1.1x^3 + 2.3x^2 + 0.5x + 3.3 = 0$ using Bairstow's method.

VII. A. Solve the following system of equations by Gauss elimination method.

$$4x_1 - 2x_2 + x_3 = 15$$
$$-3x_1 - x_2 + 4x_3 = 8$$
$$x_1 - x_2 + 3x_3 = 13$$

OR

B. Solve the following system of equations by relaxation method.

$$8x_1 - x_2 - x_3 = 8$$
$$2x_1 + x_2 + 9x_3 = 12$$
$$x_1 - 7x_2 + 2x_3 = 13$$

VIII. A. Write the Lagrange's interpolation polynomial that passes through the points $(0,-5), (1, 1), (3,49), (4.5,91.125)$. Also find the value of the polynomial at $x = 4$.

OR

B. Fit the data

x	:	0.0	1.0	1.5	2.25
$f(x)$	:	2.0000	4.4366	6.7134	13.9130

with a cubic spline curve.

IX. A. Write an algorithm to obtain an estimate of the derivative from a divided difference table.

OR

B. Evaluate $\int_0^{1.5} e^{-x^2} dx$ using Simpson's 3/8 rule with $h = \cdot 25$.

X. A. Use Runge-Kutta method to solve for $y(0.5)$ from $\frac{dy}{dx} = x + y + xy,\ y(0) = 1$ with $h = 0.1$.

OR

B. Use Adams-Moulton method to solve for $y(0.6)$ from $\frac{dy}{dx} = y \sin \pi x,\ y(0) = 1$ with $h = 0.2$.

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