MCA.II/05.15.0395 Reg. No. | | | | | | | | |

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M.C.A. DEGREE II SEMESTER EXAMINATION MAY 2015

CAS 2204 APPLIED NUMERICAL ANALYSIS

(*Supplementary*)

Time: 3 Hours Maximum Marks: 50

PART A

(Answer ***ALL*** questions)

(15 × 2 = 30)

I. (a) Describe the secant method and compare the secant iterative formula with the Newton formula for estimating a root.
(b) Write the algorithm for fixed point method for solving a system of non-linear equations.
(c) Muller's method is an extension of secant method. Explain.

II. (a) What are the axioms of the Euclidean norm? Define the three matrix norms and illustrate through an example.
(b) What is meant by condition number of a matrix? Give examples of ill-conditioned and well-conditioned matrices.
(c) Explain the basic concept used in the relaxation method.

III. (a) Explain the method of least squares for fitting a power function $y = ax^b$.
(b) Explain B-spline curve.
(c) Given a set of n+1 points, state the general form of the n^{th} degree Lagrange's interpolation polynomial.

IV. (a) State the three numerical differentiation formulae and compare their truncation errors.
(b) Describe the trapezoidal method of computing integrals.
(c) Explain Gaussian quadrature formula with an example.

V. (a) Explain modified Euler's method to solve $y' = f(x, y)$ with the initial condition $y(x_0) = y_0$.
(b) Explain the third and fourth order Runge-Kutta methods for solving a differential equation.
(c) State the predictor and corrector formulae used in Adams-Moulton method.

PART B

(5 × 4 = 20)

VI. Find the roots of the equation, $x^3 - 2x^2 - 3x + 10 = 0$, correct to three decimal places.

OR

VII. Use Bairstow's method to estimate the roots of $f(x) = x^4 - 2x^3 + 4x^2 - 4x + 4$.

VIII. Solve the system by the Gauss elimination method.
$2x + 2y + z + 2w = 7$, $x - 2y - w = 2$,
$3x - y - 2z - w = 3$ and $x - 2w = 0$

OR

IX. Find the solution to two decimal places, using Jacobi's method, for the system,
$10x + 2y + z = 9$,
$2x + 20y = 2z = -44$ and
$-2x + 3y + 10z = 22$

(P.T.O.)

X. Find the values of a, b, c so that $y = a + bx + cx^2$ is the best fit to the data

x	0	1	2	3	4
y	1	0	3	10	21

OR

XI. Fit a cubic B-spline to the data $-2, -1, 0, 1, 2$. Show also that the B-spline S is unique if $S(-1)$ is given

XII. A rod is rotating in a plane. The following table gives the angle θ (radians) through which the rod has turned for time t (in seconds). Find the angular velocity of the rod at time $t = 0.6$.

t	0	0.2	0.4	0.6	0.8	1.0	1.2
θ	0	0.122	0.493	1.123	2.022	3.2	4.66

OR

XIII. Compute the values of $\int_0^1 \frac{dx}{1+x^2}$ by using trapezoidal rule with h = 0.5 and 0.25. Then obtain a better estimate by using Romberg's method.

XIV. Given that $\frac{dy}{dx} - \sqrt{xy} = 2, y(1) = 1$. Find $y(2)$ in steps of 0.25 using Euler's modified method.

OR

XV. Use the Runge-Kutta fourth order method to find $y(1)$, given that $y(0) = 1$ and $\frac{dy}{dx} = \frac{y-x}{y+x}$.

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