Registration no: | | | | | | | | | | |

Total Number of Pages: 2 **MCA/ MCC205**

2nd Semester Regular / Back Examination – 2016
COMPUTER BASED NUMERICAL METHODS
Question Code no: W 465
BRANCH(S): MCA
Time: 3 Hours
Max Marks: 70

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

a) True value of x is $^{10}/_{3}$ and approximate value is 3.33. Find the absolute and relative errors.
b) Define error. What are different sources of errors?
c) Write the iterative formula to find the square root of a number N by Newton-Raphson method.
d) What is ill conditioning? How can we detect ill conditioned systems?
e) State four point Gaussian quadrature formula.
f) What is inverse interpolation? How it is different from interpolation?
g) If $\lambda_1$is the largest Eigen value of the matrix A, write the suitable method mathematically which will yield the smallest Eigen value
h) What is the condition for the convergence of the iterative method for solving $x = \varphi(x)$?
i) Write down Euler's algorithm to solve the ordinary differential equation of first order.
j) What is the difference between modified Euler's formula and Runge-Kutta method of order 2?

Q2 a) Obtain a root, correct to three decimal places, for the following equation using the bisection method: (5)

$$x^3 - 4x - 9 = 0.$$

b) Use Newton-Raphson method to obtain a root, correct to three decimal places of the following equation; (5)

$$\sin x = 1 - x$$

Q3 a) Compute inverse of the following matrix by using Gauss-Jordan Method: (5)

$$A = \begin{bmatrix} 3 & 2 & 4 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{bmatrix}$$

b) Solve the following system of equations by using Gauss Elimination method: (5)

$$\begin{aligned} 5x &- 2y + z = 4 \\ 7x &+ y - 5z = 8 \\ 3x &+ 7y + 4z = 10 \end{aligned}$$

Q4 Using power method, find all the Eigen values of the following matrix: (10)

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$

Q5 Given the set of tabulated points (1, -3), (3, 9), (4, 30), and (6, 132), obtain the value of y when x = 2 by using (10)

i) Newton's divided-difference formula.
ii) Lagrange's interpolation formula

Q6 Calculate the approximate value of the following by using (i) Composite Trapezoidal rule, (ii) Composite Simpson's 1/3 rule, using 11 ordinates. Also compute the error bound in each case. (10)

$$I = \int_0^{\pi/2} \sin x \, dx$$

Q7 $Given, \quad \frac{dy}{dx} = y - x \quad with\ y(0) = 2.$ (10)

Find $y(0.1), y(0.2)$ and $y(0.3)$ by using Runge-Kutta method of order 4.

Q8 a) $Solve\ \frac{dy}{dx} = x^2 + y^2 \quad given,\ y(0) = 1.$ Obtain the value of $y(0.1)$ by using Picard's method. (5)

b) Solve and get $y(0.2)\ given\ \frac{dy}{dx} = \frac{1}{2}(x + y)\ with\ y(0) = 2,\ y(0.5) = 2.636,\ y(1) = 3.595,\ y(1.5) = 4.968$ by Adam's method. (5)