Roll No.										

Paper Code: MCA-212

MCA

(SEM II) EVEN SEMESTER EXAMINATION, 2015-16

COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

[TIME: 3 hrs.] **[Max. Marks: 100]**

Note: Attempt All Questions. All Question carry equal marks.

Q.1 Attempt any four of the following:- **(5x4=20)**

(a) What are errors? Explain types of errors.
(b) If 0.333 is the approximate value of 1/3, find the absolute, relative and percentage error.
(c) Apply Newton-Raphson's method to determine a root of the equation $f(x) = \cos x - x e^x$.
(d) In case of Normalized floating point representation, associative & Distributive laws are invalid. Explain.
(e) Find a real root of x^3– 2x-1=0 which lie between 1 and2 by using bisection method correct to 2 places of decimal.
(f) A real root of the equation $f(x) = x^3 - 5x + 1 = 0$ lies in the interval (0,1).perform four iterations of the secant method and the Regula-Falsi method to obtain this root.

Q.2 Attempt any four of the following:- **(5x4=20)**

(a) Find the missing term in the table

x	1	1.5	2	2.5	3	3.5	4
f(x)	6	?	10	20	?	15	5

(b) Prove the following relation between the operator

a) $\Delta = E-1$ (b)$\nabla = 1 - E^{-1}$ (c) $\delta = E^{1/2} - E^{-1/2}$ (d) $\Delta = E\nabla$

(c) Using Lagrange's interpolation formula, find the polynomial form of the function f(x) tabulated as below:

x	0	2	5	1
f(x)	0	8	125	1

(d) By Newton's method, find f(x), where

x	3	7	9	10
f(x)	168	120	72	63

What is the best estimate for the value of the function at the position 6?

(e) If the third differences constant, prove that

$$y_{x+1/2} = \frac{1}{2}(y_x + y_{x+1}) - \frac{1}{16}(\Delta^2 y_{x-1} + \Delta^2 y_x)$$

(f) Perform two iterations of the Chebyshev method to find an approximate value of 1/7. Take the initial approximation as x_0 =0.1

Q.3 Attempt <u>any two</u> of the following:- **(10x2=20)**

(a) Use Runge-Kutta method to approximate y when x=0.1 and x=0.2, given that x=0 when y=1 and $\frac{dy}{dx} = x + y$.

(b) Use Picard's method to approximate the value of y when x=0.1, given that y=1 when x=0 and $\frac{dy}{dx} = 3x + y^2$.

(c) Dividing the interval of integration into 6 equal parts, evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using:

i. trapezoidal rule
ii. Simpson's 1/3 rule.
iii. Simpson's 3/8 rule.

Hence obtain the approximate value of π in each case.

Q.4 Attempt <u>any two</u> of the following:- **(10x2=20)**

(a) Fit the exponential curve $y = ae^{bx}$ to the data:

X	0	1	2	3	4	5
Y	1	3	6	10	20	36

(b) From the table calculate the number of students getting marks more than 45 and between 40 and 45

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

(c) Solve the following system of equations using Gaussian Elimination

$$x_1 + x_2 - x_3 = 4$$
$$x_1 + x_2 - x_3 = -3$$
$$3x_1 + 2x_2 - 3x_3 = 6$$

Q.5 Attempt <u>any two</u> of the following:- **(10x2=20)**

(a) What are two types of Hypothesis testing?
(b) Write a program for Newton Raphson Method.
(c) Explain different Forecasting Methods. How should you structure a forecasting problem?