(c) Find f(8) from the following table :

x	1	2	4	7	12
f(x)	22	30	82	106	206

5. (a) Write a 'C' program to implement Simpson's 1/3 rule of numerical integration.

(b) Evaluate $\int_4^{5.6} \log_e x \, dx$, using Boole's rule with eight subintervals. Compare it with exact value.

(c) Compute y(0.2) from the following differential equation using Runge-Kutta method of fourth order in one step :

$$\frac{dy}{dx} = xy + y^2, \quad y(0) = 1.$$

6. (a) Find the curve $y = ax + bx^2$ that best fits to the following data :

x	1	2	3	4	5
y	1.8	5.1	8.9	14.1	19.8

(b) Write a short note on frequency charts of statistical documentation.

(c) Find a regression line of y on x from the following :

x	–1	0	1	2	3	4	5	6
y	10	9	7	5	4	3	0	–1

7. (a) Calculate four yearly moving average of the data given below :

Year	1972	1973	1974	1975	1976	1977
Production	614	615	652	678	681	655

Year	1978	1979	1980	1981	1982
Production	717	719	708	779	757

(b) Discuss how statistical data can be used in quality control of industrial products.

(c) What is analysis of variance ? What is the significance of its study ?

Printed Pages—4 **NMCA212**

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

PAPER ID : 214219 **Roll No.**

MCA

(SEM. II) THEORY EXAMINATION 2013-14

COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

MCA212

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

PAPER ID : 214214 **Roll No.**

MCA

(SEM. II) THEORY EXAMINATION 2013-14

COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

Time : 3 Hours *Total Marks : 100*

Note :– Attempt **all** Sections.

SECTION—A

1. Attempt **all** parts of this question : **(2×10=20)**

(a) Divide .9998E1 by .1000E–99. Indicate whether the result overflows or underflows.

(b) Find the rate of convergence of Bisection method.

(c) Prove that $(E^{1/2} + E^{-1/2})(1 + \Delta)^{1/2} = 2 + \Delta$.

(d) Given f(–5) = 192, f(–1) = 52, f(2) = 10 and f(9) = 0.2; construct a divided difference table for f(x).

(e) Obtain y(0.15) by using Euler's method in two steps for the differential equation :

$$\frac{dy}{dx} = x^2 + y^2 , y(0) = 0$$

(f) Use Simpson's 1/3 rule with h = 0.5 to evaluate $\int_0^2 (x^2 - 3x + 4)dx$.

(g) The two regression lines are $8x - 10y + 66 = 0$ and $40x - 18y = 214$. Find the mean values of x and y.

(h) Write the normal equations to fit the curve $y = ax + \frac{b}{x}$, i = 1, 2, ..., n, using method of least squares.

(i) Write components of time-series.

(j) Write the test of significance for student's t-distribution.

SECTION–B

2. Attempt any **three** parts of the following : **(3×10=30)**

(a) The equation $\cos\left\{\frac{\pi(x+1)}{\theta}\right\} + 0.14x - 0.9062 = 0$, has two roots greater than –1. Calculate these roots correct to five decimal places.

(b) Solve the following system of equations using Gauss-elimination method with partial pivoting :

$$2x_2 + x_4 = 0$$
$$2x_1 + 2x_2 + 3x_3 + 2x_4 = -2$$
$$4x_1 - 3x_2 + x_4 = -7$$
$$6x_1 + x_2 - 6x_3 - 5x_4 = 6.$$

(c) Using Adams-Moulton predictor-corrector formula, find y(1.4) with h = 0.1 for the differential equation :

$$\frac{dy}{dx} = x^2(1 + y), \quad y(1) = 1$$

Obtain the starting values using Euler's method.

(d) Obtain a least square fit of the form $f = ae^{-3t} + be^{-2t}$ to the following data :

t	0.1	0.2	0.3	0.4
f(t)	0.76	0.58	0.44	0.35

(e) From the adult male population of four large Cities, random sample of sizes given below were taken and the number of married and single men recorded. Do the data indicate any significant variation among the Cities in the tendency of men to marry ? (Given that, for $\gamma = 3$, $\chi^2_{0.05} = 7.815$).

City	A	B	C	D
Married	137	164	152	147
Single	32	57	56	35

SECTION–C

Note :– Attempt any **two** parts from each question of this Section. **(2×5)×5=50**

3. (a) Find a root of the following equation correct to three decimal places using Regula-Falsi method :

$$3x + \sin x - e^x = 0$$

(b) Using fixed point iteration method, find the root of the equation $3x - \log_{10}x - 6 = 0$, correct to four decimal places.

(c) The equation $x^3 - 5x^2 + 4x - 3 = 0$ has one root near x = 4 which is computed by the iteration formula

$Kx_{n+1} = 3 + (K-4)x_n + 5x_n^2 - x_n^3$, K is an integer with $x_0 = 4$. Determine the value of K which will give the fastest convergence.

4. (a) Solve the following system of equations using Gauss-Seidal method (Three iterations) :

$$9x + 4y + z = -17; \; x - 2y - 6z = 14; \; x + 6y = 4$$

(b) Find the number of men getting wages between Rs. 10 and Rs. 15 from the table :

Wages (in Rs.)	0–10	10–20	20–30	30–40
Frequency	9	30	35	42