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

PAPER ID : 214201 Roll No. | | | | | | | | | | |

MCA.

(SEM. II) THEORY EXAMINATION 2013-14

COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

Time : 3 Hours *Total Marks : 100*

Note :– Attempt questions from each Section as indicated :

SECTION–A **(10×2=20)**

Attempt **all** parts :

1. Define 'Absolute error' and 'Relative error'. An approximate value of π is given as 3.1428571 and its true value is 3.1415926. Find absolute and relative errors.
2. In a normalized floating point mode, carry out the following mathematical operation : (0.4546 E3) + (0.5454 E8).
3. Evaluate $\sqrt{2}$ correct to four decimal places using Newton-Raphson method.
4. Write an algorithm for finding roots using iteration method.
5. What is an ill-conditioned system ?
6. What do you mean by interpolation and extrapolation ?
7. Find unique polynomial p(n) of degree 2 such that : P(1)=1, P(3)=27, and P(4) = 64.

8. What is the principle of least squares for curve fitting.

9. Prove the formula for fitting a straight line.

10. Explain the terms :

    (a) Null hypothesis

    (b) Level of significance.

SECTION–B (3×10=30)

Attempt any **three** :

1. (a) Write an algorithm for Regula-Falsi method. Also implement this algorithm in C language.

    (b) Prove that order of convergence of Secant method is 1.62.

2. (a) Find the real root of the equation $x^3 + x^2 - 1 = 0$ on the interval [0, 1] with the accuracy of 10^{-4} by iteration method.

    (b) Determine it the following system is ill-conditioned :

$$100x - 200y = 100$$
$$-200x + 400y = -100$$

3. Apply Gauss-Siedal iteration method to solve the equations :

$$20x + y - 2z = 17 ; 3x + 20y - z = -18 ; 2x - 3y + 20z = 25$$

4. Find the value of log 58.75, if the given table is :

x	40	45	50	55	60	65
log x	1.60206	1.65321	1.69897	1.74036	1.77815	1.81291

5. Prove that :

    (i) $E = 1 + \Delta$

(ii) $\Delta = \nabla(1-\nabla)^{-1}$

(iii) $\delta = E^{1/2} + E^{-1/2}$

(iv) e^{hD}

(v) $\nabla = 1 - E^{-1}$

SECTION–C (5×10=50)

Attempt any **five** :

1. (a) Apply Gauss forward formula to get f (3.75), if given :

x :	2.5	3.0	3.5	4.0	4.5	5.0
f :	24.145	22.043	20.225	18.644	17.262	16.047

(b) Apply Bessel's formula to obtain y_{25} from the table below :

x :	20	24	28	32
y :	2854	3162	3544	3992

2. (a) Prove that n^{th} differences of a polynomial of degree n is constant and all other higher differences are zero.

(b) Explain Numerical differentiation and Numerical integration.

3. Find y(1), if y(x) is the solution of $\frac{dy}{dx} = x^2 + y^2$ by Range-Kutta method, in two steps taking h = 0.5. Given y(0) = 0

4. Evaluate $\int_0^6 dx / (1+x^2)$ using

(i) Simpson's 1/3 rule

(ii) Simpson's 3/8 rule

5. A rod is rotating in a plane the following table gives the angle θ (in radians) through which the rod has turned for various values of time t (in seconds). Calculate the angular velocity of the rod at t = 0.6 seconds :

t :	0	0.2	0.4	0.6	0.8	1.0
θ :	0	0.12	0.49	1.12	2.02	3.20

6. (a) For 10 observations on price 'x' and supply 'y'. The following data were obtained : $\Sigma x = 130$, $\Sigma y = 220$, $\Sigma x^2 = 228$, $\Sigma y^2 = 5506$, $\Sigma xy = 3467$. Obtain the line of regression of 'y on x' and estimate the supply when price is 16 units.

(b) Prove that regression coefficients are independent of origin but not to scale.

7. (a) A die is thrown 90 times and the no. of faces shown are :

faces :	1	2	3	4	5	6
frequency :	18	14	13	15	14	16

Test whether the die is fair (Given χ^2_5 and .05 = 11.07)

(b) Given the following information about two samples drawn from two normal population :

$n_1 = 8$, $\Sigma (x - \bar{x})^2 = 94.5$, $n_2 = 10$ and $\Sigma (y - \bar{y})^2 = 101.7$

Test the equality of two popular variances. (Given : $f_{7,9}(0.5) = 3.29$)