(b) Distinguish between p-chart, np-chart and c-chart of statistical quality control.

(c) Discuss advantages and disadvantages of moving average method used for estimation of trend values.

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

PAPER ID : 9615 Roll No. 1 0 2 9 0 1 4 0 1 4

M. C. A.

(Second Semester)Theory Examination, 2010-11

COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES

Time : 3 Hours] *[Total Marks : 100*

Note : Attempt *all* questions.

Section-A

All parts of this question are compulsory : 2×10=20

1. Pick the correct answer of the choice given below :

(a) If a number is correct to n decimal places, the error is equal to :

(i) 10^{-n} (ii) $\frac{1}{2}10^{-n}$

(iii) 10^{-n+1} (iv) $\frac{1}{2}10^{-n+1}$.

(b) In the Simpson's one-third rule the curve $y=f(x)$ is assumed to be a :

(i) Circle (ii) Parabola

(iii) Hyperbola (iv) None of these.

(c) The Gauss-Seidal method gives results faster when the pivotal elements are :

(i) Smaller than other coefficients

(ii) Larger than other coefficients

(iii) Equal to other coefficients

(iv) None of these.

(d) If Δ and ∇ are the forward and backward difference operators respectively, then $\Delta - \nabla$ is equal to :

(i) $-\Delta.\nabla$ (ii) $\Delta.\nabla$

(iii) $\Delta+\nabla$ (iv) Δ/∇

Indicate True or False of the following :

(e) (i) $\Delta = E + 1$ (True/False)

(ii) $\delta = E^{1/2} + E^{-1/2}$ (True/False)

(f) The regression measures the nature and extent of correlation. (True/False)

(g) If one of the regression coefficient is greater than unity, the other must be less than unity. (True/False)

Fill in the blanks with correct answer :

(h) The number of intervals in the Simpson's 3/8 rule of integration should be in multiple of ..... (one/two/three)

(i) The geometric mean of the regression coefficients is equal to ..... ($\sqrt{r}$ /r/r^2)

(j) Statistical quality control charts are based on the .....

(theory of probability/test of significance)

Section-B

Attempt any *three* parts of the following. 10×3=30

2. (a) Explain, what do you understand by rate of convergence of a method to find out the root of an equation. Show that the Newton-Raphson method is better than the secant method in respect to rate of convergence.

(b) Derive the Newton's Gregory formula for forward interpolation.

Hence obtain the value of f (2.5) from the following data :

x	2	4	6	8	10
$f(x)$	15	10	5	7	13

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

(d) Explain the method of least squares to fit a curve. Hence obtain a second degree parabola from the following data :

x	0	5	10	15	20	25
y	1.5	6.2	15.3	20.0	23.7	28.6

(e) What is time series analysis ? Explain the objectives of the analysis of a time series. Why the time series analysis is important in technology.

Section-C

Attempt any *two* parts from each question. All questions are compulsory. $5 \times 2 \times 5 = 50$

3. (a) Let x^* approximate x correct up to n significant digits if e^x is evaluated for x, $-8 \le x \le 9$, then what should be relative error ?

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

(c) Write a computer program in C for the Regula-Falsi method.

4. (a) Solve the following systems of equations by Gauss elimination method (three iteration) :

$$x - y + z = 1$$
$$-3x + 2y - 3z = -6$$
$$2x - 5y + 4z = 5.$$

(b) Prove that the nth differences of a polynomial of nth degree is constant and all higher order differences are zero.

(c) The table gives the distance (y) in km, of the visible horizon for the given hights (x) in meter above the earth's surface :

x	100	150	200	250	300	350	400
y	10.63	13.03	15.04	16.81	18.42	19.90	21.27

use Newton-Gregory's forward interpolation formula to find the value of y when $x = 160$ meter.

5. (a) A train is moving at the speed of 30 m/sec. Suddenly brakes are applied. The speed of the train per second after t seconds is given by :

Time (t)	0	5	10	15	20	25	30	35	40	45
Speed (v)	30	24	19	16	13	11	10	8	7	5

Apply Simpson's three-eight rule to determine the distance moved by the train in 45 seconds.

(b) 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(sec.). Calculate the angular velocity of the rod at $t = 0.6$ seconds.

(c) Given that :

$$\frac{dy}{dx} = 1 + y^2$$

and $y(0.6) = 0.6841$, $y(0.4) = 0.4228$, $y(0.2) = 0.2027$, $y(0) = 0$. Find $y(-0.2)$ using Milne's predictor corrector method.

6. (a) What is Regression analysis ? Describe the method of least squares to obtain the regression lines.

(b) In trivariate distribution, the following data have been obtained :

X_1 :	1	2	3	4
X_2 :	0	1	2	3
X_3 :	12	18	24	30.

Find the regression equation of X_3 on X_1 and X_2.

(c) Write a short note on frequency charts in statistical documentation.

7. (a) A survey of 320 families with 5 children shows the following distribution :

Number of boys & girls	5 boys 0 girl	4 boys 1 girl	3 boys 2 girls	2 boys 3 girls	1 boy 4 girls	0 boy 5 girls	Total
Number of families	18	56	110	88	40	8	320

Given that value of χ^2 for 5 degree of freedom are 11.1 and 15.1 at 0.05 and 0.01 significance level respectively, test the hypothesis that male and female births are equally probable.