

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

PAPER ID : 9615

Roll No.

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M.C.A.

(SEM. II) THEORY EXAMINATION 2010-11

COMPUTER BASED NUMERICAL AND**STATISTICAL TECHNIQUES***Time : 3 Hours**Total Marks : 100***SECTION-A**

1. All parts of this question are compulsory : (2×10=20)

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) The rate of convergence of Regula-Falsi method is equal to :

(i) 1

(ii) 1.618

(iii) 2

(iv) 0.5

Indicate True or False of the following :

(c) (i) $\Delta \equiv E-1$

(True/False)

(ii) $\Delta \equiv E+1$

(True/False)

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

Fill up the blanks with correct answer :-

- (e) The number of intervals in Simpson's 1/3 rule of integration should be in multiple of (One/two/three)
- (f) The order of error in Simpson's 1/3 rule of integration is ($O(h^2)/O(h^4)/O(h^7)$)
- (g) The regression measures the nature and extent of (Standard deviation/correlation)
- (h) If one of the regression co-efficient is greater than unity, the other must be than unity. (greater/less)

Pick the correct answer of the choices given below :

- (i) The geometric mean of the regression coefficients is equal to :
- (i) 1 (ii) r
 (iii) r^2 (iv) \sqrt{r}
- (j) The order of the $u_{j+1} = u_j + \frac{1}{2}(K_1 + K_2)$, Runge-Kutta method is
- (i) one (ii) two
 (iii) three (iv) four

SECTION-B

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

- (a) Obtain the rate of convergence for secant method and Newton-Raphson method. Hence find out which method converges more faster.
- (b) Derive the Newton-divided difference formula, hence calculate $f(3)$ from the following data :

x:	0	1	2	4	5	6
f(x):	1	14	15	5	6	19

- (c) Find $y(2)$ if $y(x)$ is the solution of $\frac{dy}{dx} = \frac{1}{2}(x+y)$ using Runge-Kutta method, in two steps taking $h = 1.0$. Given $y(0) = 2.0$.
- (d) Fit the curve $pv^n = K$ to the following data :

p (Kg/cm ²):	0.5	1.0	1.5	2.0	2.5	3.0
v (liters):	1620	1000	750	620	520	460

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

SECTION-C

Attempt any two parts from each question. All questions are compulsory. (5×2×5=50)

3. (a) Define absolute error and relative error. If true value = $10/3$ and approximate value = 3.33, then find absolute and relative errors.

(b) If the equation $x^6 - x^4 - x^3 - 1 = 0$ has one real root between 1.4 and 1.5, using Newton-Raphson method, find the root correct up to 4 decimal places.

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

4. (a) Apply Gauss-Seidel iteration method to solve the following equations (three iterations only) :

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25$$

(b) Find the unique polynomial $P(n)$ of degree two such that :

$$P(1) = 1, P(3) = 27, P(4) = 64$$

Use Lagrange's method of interpolation.

- (c) Fit the polynomial of degree four which takes the following values :

x :	2	4	6	8	10
y :	0	0	1	0	0

5. (a) Compute $\int_0^{\pi/2} \sin x \, dx$ using Simpson's three-eighth rule of

integration, taking $h = \frac{\pi}{18}$.

- (b) A rod is rotating in a plane. The following table gives the angle θ (radians) through which the rod has turned for various values of the time 't' second :-

t :	0	0.2	0.4	0.6	0.8	0.9	1.2
θ :	0	0.12	0.49	1.12	2.02	3.20	4.67

Calculate the angular velocity of the rod when $t = 0.6$.

- (c) Write a computer program in C for the trapezoidal rule of integration.
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 the price is 16 units.

- (b) Fit a second degree curve of regression of y on x to the following data :

$x :$	1.0	2.0	3.0	4.0
$y :$	6.0	11.0	18.0	27.0

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

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

- (b) Explain the following terms clearly :-

(i) Null Hypothesis

(ii) Level of Significance.

- (c) A survey of 320 families with 5 children shows the following distribution :-

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

Given that 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.