

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

Paper ID : 214219

Roll No.

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M.C.A.

Theory Examination (Semester-II) 2015-16

**COMPUTER BASED NUMERICAL &
STATISTICAL TECHNIQUES***Time : 3 Hours**Max. Marks : 100***Note : Attempt questions from all Sections as per directions.****Section-A****Attempt all parts of this section. Answer in brief.****(2×10=20)**

- Q1. (a) Round off the numbers 865250 and 37.46235 to four significant figures and compute E_a , E_r and E_p .
- (b) Associative and distributive laws are not always valid in case of normalized floating point representation. Give example to prove this statement.
- (c) Express $1+x-x_2+x_3$ as sum of Chebyshev polynomials.

(1)

P.T.O.

- (d) Find the number of terms of the exponential series such that their sum gives the value of e^x correct to six decimal places at $x=1$.
- (e) Prove the Taylor's series for a function of one variable.
- (f) Write any four advantages of statistical quality control.
- (g) Prove the following identities:
- (i) $E = 1 + \Delta$
 - (ii) $\delta = E^{1/2} - E^{-1/2}$
- (h) The order of the $u_{j+1} = u_j + 1/2 (K_1 + K_2)$ by Runge-Kuttamethod is
- (i) one
 - (ii) two
 - (iii) three
 - (iv) four
- (i) Prove the formul a for fitting a straight line.
- (j) Explain Hypothesis and its type.

Section-B

Q2. Attempt any five questions from this section.

(10×5=50)

- a) Obtain the rate of convergence for Secant method and Newton-Raphson method. Hence find out which method converges more faster.
- b) By the method of least squares. find the curve $y=ax + bx^2$ that best fits the following data:

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

- c) Apply Gauss's Forward formula to find the value of $f(x)$ at $x=3.75$ from the table:

| | | | | | | |
|------|--------|--------|--------|--------|--------|--------|
| x: | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 |
| t(x) | 24.145 | 22.043 | 20.225 | 18.644 | 17.262 | 16.047 |

- d) Solve the equation $dy/dx = x+y$ with initial condition $y(0) = 1$ by Runge-Kutta rule from $x=0$ to $x=0.4$ with $h=0.1$.
- e) The population of a town was as given. Estimate the population for the year 1925.

| | | | | | |
|---------------|------|------|------|------|------|
| Year (x) | 1891 | 1901 | 1911 | 1921 | 1931 |
| Population(y) | 46 | 66 | 81 | 93 | 101 |

(3)

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- f) What is time-series analysis? Explain the objectives of analysis of a time series. Why is time-series analysis important in technology?
- g) Prove that regression coefficients are independent of origin but not to scale.
- h) Value of $f(x)$ for values of x are given as : $f(1) = 4, f(2) = 5, f(7) = 5, f(8) = 4$. Find $f(6)$ and also the value of x for which $f(x)$ is maximum or minimum using Lagrange's formula.

Section-C

Attempt any two questions from this section. (15×2=30)

Q3. Show that: $f\left(\frac{a+b}{2}\right) = \frac{f(a)+f(b)}{2} + \frac{(b-a)[f'(a)-f'(b)]}{8}$ by Hermite's interpolation.

Q4. Find the cubic spline corresponding to the interval [2,3] from the following table:

| | | | | | |
|----|----|----|----|----|----|
| x: | 1 | 2 | 3 | 4 | 5 |
| y: | 30 | 15 | 32 | 18 | 25 |

Hence compute $y(2.5)$ and $y'(3)$.

- Q5. (i) Find the root of the equation $\tan x + \tanh x = 0$ which lies in the interval (1.6, 3.0) correct to four significant digits using method of false position.
- (ii) Explain CHI-SQUARE test and write the Yates's correction for test of independence.