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*2142 *

NMCA 212

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

PAPER ID : 214219

Roll No.

M.C.A. (SEM. II)

THEORY EXAMINATION, 2014-15

COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

Time : 3 Hours]   [Total Marks : 100

Note: Attempt all questions.

1. Attempt any four parts of the following :   5x4=20

   (a) If $\sqrt{29} = 5.385$ and $\sqrt{\pi} = 3.317$ correct to four significant figures. Find the relative errors in their sum and differences.

   (b) Perform the following operations :

   (i) .4546 E 5 + .5433 E 7

   (ii) .9432 E - 4 - .5452 E - 3

214219]   (1)   [Contd...

(c) Find the smallest positive root of $x^3 - 9x + 1 = 0$ using Bisection method correct to three decimal places.

(d) Write an algorithm for Newton Raphson method. What is the order of convergence of Newton Raphson method in case of multiple roots?

(e) If transcendental equation is given as :

$$f(x) = 2^x - x - 3$$

then calculate $f(x)$ for $x = -3, -2, -1, 0, 1, 2, 3$ and compute, between which integers values roots are lying.

(f) Define normalized floating point representation of numbers and round off errors in representation.

2. Attempt any four parts of the following :   5x4=20

(a) From the table of divide difference by using the following data and obtain f(2) and f(15) :

x	4	5	7	10	11	13
f(x)	48	100	294	900	1210	2028

(b) Prove that the order of convergence of Secant method for finding the roots of equation is 1.62.

(i)   Forecasting models

(ii)   Frequency charts in statistical documentation

—x—

(c) Apply Gauss backward formula to find sin45° from the following table :

θ°	20	30	40	50	60	70	80
sin θ	0.34202	0.502	0.64279	0.76604	0.86603	0.93969	0.98481

(d) Apply Hermite's formula to find the value of sin(1.05) from the following data :

x	1.00	1.10
sin (x)	0.84147	0.89121
cos (x)	.540300	.45360

(e) Solve the following equations by Gauss elimination method correct to three significant digits :

$$3x_1 + 2x_2 - 5x_3 = 0$$
$$2x_1 - 3x_2 + x_3 = 0$$
$$x_1 + 4x_2 - x_3 = 4$$

(f) The table gives the distance (y) in km, of the visible horizon for the given heights (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's forward interpolation formula to find the value of y when x=160 meters.

3 Attempt any two parts of the following : 10x2=20

(a) Using Runge-Kutta method of fourth order, solve for y(0.1),y(0.2) and y(0.3) given that $y' = xy + y^2$, $y(0) = 1$.

(b) Find the value of the integral $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rule.

(c) Write down the algorithm for Boole's rule. Evaluate $\int_0^4 \frac{dx}{1+x^2}$ using Boole's rule taking h=1.

4. Attempt any two parts of the following : 10x2=20

(b) Determine the constants a and b by the method of least squares such that $y = ae^{bx}$ fits the following data:

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

(b) Obtain an approximation in the sense of the principles of least squares in the form of a polynomial of second degree to the function $f(x) = 1/(1+x^2)$ in the range $-1 \le x \le 1$.

214219] (4) [Contd...

(c) Define linear and non-linear regression. Calculate linear regression coefficients for the following :

x	1	2	3	4	5	6	7	8
y	3	7	10	12	14	17	20	24

5. Attempt any two parts of the following : 10x2=20

(a) What is Chi-square test? What are the conditions for applying it? Calculate Chi-square for the following data:

Class	A	B	C
Observed frequency	37	44	19
Expected frequency	31	38	31

(b) Calculate the trend values by the method of moving averages, assuming a four yearly cycle from the following data relating to sugar production in India.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Sugar Production (in lakh tones)	114	115	152	178	181	155	217	219	208	279	267

(c) Write short notes on :

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