MCA (Revised)

Term-End Examination

December, 2008

MCSE - 004 : NUMERICAL AND STATISTICAL COMPUTING

Time: 3 hours Maximum Marks: 100

Note: Question Number 1 is compulsory. Attempt any three Questions from the rest. Use of Calculator is allowed.

- 1. (a) If 0.333 is the approximate value of 1/3, 4 find absolute, relative and percentage errors.
 - (b) Find the value of n (the number of term required) in the expansion of e^x , such that their sum yields the value correct to 8 decimal places at x = 1.
 - (c) Find the root of the equation $xe^x = \cos x$ using the Regula-Falsi method correct to four decimal places.
 - (d) Find the polynomial function f(x) given that f(0) = 2, f(1) = 3, f(2) = 12 and f(3) = 35. Hence find f(5) using Lagrange's interpolation formula.

(e) Evaluate $\int_0^1 \frac{dx}{1+x}$ by using

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- (i) Trapezoidal rule
- (ii) Simpson's 1/3 rule
- (f) The probability that an evening college student will graduate is 0.4. Determine the probability that out of 5 students (i) none (ii) one and (iii) atleast one will be graduate.
- (g) The following data about the sales and advertisement expenditure of a firm is given below:

	Sales (in crores of Rs.)	Advertisement expenditure (in crores of Rs.)
Means	40	6
Standard deviations	10	1.5

Coefficient of Correlation (r) = 0.9

- (i) Estimate the likely sales for a proposed advertisement expenditure of Rs. 10 crores.
- (ii) What should be the advertisements expenditure, if the firm proposes a sales target of 60 crores of rupees?

- 2. (a) By using the Bisection method, find an approximate root of the equation $\sin x = \frac{1}{x}$ that lies between x = 1 and x = 1.5 (measured in radians). Carry out computation upto 5th stage.
 - (b) Estimate the number of students, who obtained less than 45 marks from the following using Newton's Forward Difference:

Marks	0 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of Students	31	42	51	35	31

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(c) Municipal Corporation installed 2,000 bulbs in the streets. If these bulbs have an average life of 1,000 burning hours, with a standard deviation of 200 hours, what number of bulbs might be excepted to fail in first 700 burning hours?

-	Given Z	1.00	1.25	1.50
-	Probability	0.159	0.106	0.067

3. (a) Solve the equation :

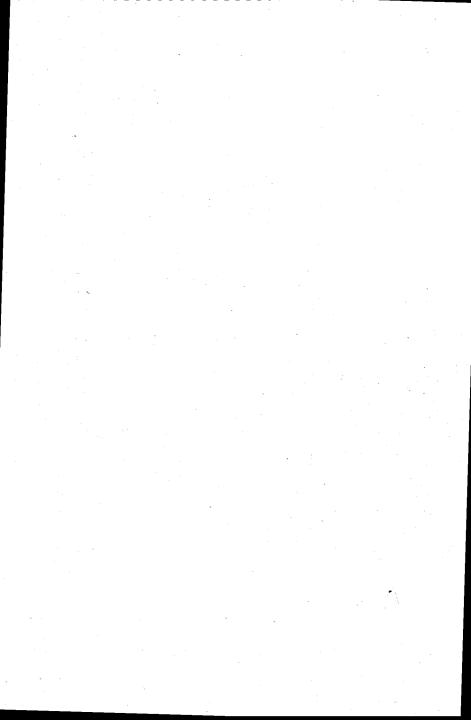
$$x_1 + x_2 + x_3 = 6$$

 $3x_1 + 3x_2 + 4x_3 = 20$
 $2x_1 + x_2 + 3x_3 = 13$

using Gauss Elimination method.

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- (b) Evaluate the integral $I = \int_{1}^{2} \frac{2x}{1+x^4} dx$ using
 - the Gauss-Legendre 1-point, 2-point and 3-point Quadrature rules. Compare with
 - the exact solution $I = Tan^{-1}(4) + \frac{\pi}{4}$
- (c) It is known from the past experience that in a certain plant there are on an average 4 accidents per month. Find the probability that in a given year there will be less than 4 accidents.
- 4. (a) Apply LU decomposition method, to solve the following equations: $4x_1 + x_2 + x_3 = 3$
 - $x_1 + 4x_2 + 2x_3 = 0$ $2x_1 + x_2 + 5x_3 = 4$
 - (b) Using Runge-Kutta method of fourth order
 - solve $\frac{dy}{dx} = \frac{y^2 x^2}{y^2 + x^2}$ with y(0) = 1 at x = 0.2
 - and x = 0.4.
 - (c) A random variable 'X' is defined as the sum 7 of faces when a pair of dice is thrown. Find the expected value of 'X'.

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- 5. (a) Find a real root of the equation $3x = \cos x + 1$, using Newton-Raphson method.
 - (b) Solve the following differential equation by Euler's method

$$\frac{dy}{dx} = \frac{y-x}{y+x}$$
, given $y(0) = 1$

Find 'y' approximately for x = 0.1 in five steps.

- (c) Write a short notes on:
 - (i) Chi-Square Distribution.
 - (ii) Least Squares Estimation.

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