MCSE - 004

MCA (Revised)

Term-End Examination

December, 2008

MCSE - 004 : NUMERICAL AND STATISTICAL COMPUTING

06847

Time : 3 hours *Maximum Marks : 100*

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

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1. (a) If 0.333 is the approximate value of 1/3, find absolute, relative and percentage errors. **4**

(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 $x = 1$. **5**

(c) Find the root of the equation $xe^x = \cos x$ using the Regula-Falsi method correct to four decimal places. **6**

(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. **6**

(e) Evaluate $\int_0^1 \frac{dx}{1+x}$ by using 6

(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. 6

(g) The following data about the sales and advertisement expenditure of a firm is given below : 7

	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. 6

(b) Estimate the number of students, who obtained less than 45 marks from the following using Newton's Forward Difference : 7

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

(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 ? 7

Given Z	1.00	1.25	1.50
Probability	0.159	0.106	0.067

3. (a) Solve the equation : 6

$$x_1 + x_2 + x_3 = 6$$
$$3x_1 + 3x_2 + 4x_3 = 20$$
$$2x_1 + x_2 + 3x_3 = 13$$

using Gauss Elimination method.

(b) Evaluate the integral $I = \int_1^2 \frac{2x}{1+x^4} \cdot dx$ using the Gauss-Legendre 1-point, 2-point and 3-point Quadrature rules. Compare with the exact solution $I = \text{Tan}^{-1}(4) + \frac{\pi}{4}$ 7

(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. 7

4. (a) Apply LU decomposition method, to solve the following equations : 7

$4x_1 + x_2 + x_3 = 3$

$x_1 + 4x_2 + 2x_3 = 0$

$2x_1 + x_2 + 5x_3 = 4$

(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 $x = 0.4$. 6

(c) A random variable 'X' is defined as the sum of faces when a pair of dice is thrown. Find the expected value of 'X'. 7

5. (a) Find a real root of the equation $3x = \cos x + 1$, using Newton-Raphson method. 7

(b) Solve the following differential equation by Euler's method 7

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

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

(c) Write a short notes on : 6

(i) Chi-Square Distribution.

(ii) Least Squares Estimation.

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