MCA (Revised)

Term-End Examination

December, 2009

09577

MCSE-004 : NUMERICAL AND STATISTICAL COMPUTING

Time : 3 hours *Maximum Marks : 100*

Note : *Question number 1 is **compulsory.** Attempt **any three** from the rest. Use of calculator is allowed.*

1. (a) Explain truncation error. Show that $a(b-c) \neq ab-ac$, where : **2+6**

$a = .05555\ E1$

$b = .4545\ E1$

$c = .4535\ E1$

(b) Use bisection Method to find a root of the equation $x^3 - 4x - 9 = 0$ **8**

Go upto 5 - iteration only.

(c) Use Gauss - Elimination method to solve the following system of equations : **8**

$$x_1 + x_2 + x_3 = 3$$

$$4x_1 + 3x_2 + 4x_3 = 8$$

$$9x_1 + 3x_2 + 4x_3 = 7$$

(d) Evaluate f(15), Given the following table of values : 8

x	-	10	20	30	40	50
$f(x)$	-	46	66	81	93	101

(e) Calculate the value of the integral, 8

$$\int_{4}^{5.2} \log x \, dx \quad \text{by.}$$

(a) Trapezoidal rule.

(b) Waddles' rule.

*(Take h = 0.2).

2. (a) Find a root (correct to three decimal place) of $x^3 - 5x + 3 = 0$ by Newton-Raphson method. 8

(b) Use Jacobi's method to solve the equation : 8

$20x + y - 2z = 17$

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

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

(c) Explain the bisection method. 4

3. (a) Given : 5+3

$f(x) = \sin(x)$

$f(0.1) = 0.09983$, $f(0.2) = 0.19867$

Use method of Lagrange's interpolation to find $f(0.16)$. Find error in $f(0.16)$.

(b) Evaluate $\int_0^1 \frac{dx}{1+x}$ Use Gauss-Legendre three point formula. 8

(c) Explain initial value problem with an example. 4

4. (a) Evaluate $\int_1^6 [\,2 + \sin(2\sqrt{x})\,]\ dx$ using simpsons' rule with 11 points. 10

(b) Solve the initial value problem 10

$u^1 = -2tu^2$ with $u(0) = 1$ and $h = 0.2$ on the interval [0,1]. Use Fourth order classical Runge Kutta method.

5. (a) A farmer buys a quantity of cabbage seeds from a company that claims that approximately 90% of the seeds will germinate if planted properly. If four seeds are planted, what is the probability that exactly two will germinate ? 8

(b) In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible. 8

Variance of $x = 9$

Regression equation :

$8x - 10y + 66 = 0$

$40x - 18y - 214 = 0$

What are

(i) Mean value of x and y.

(ii) Correlation coefficient between x and y.

(iii) Standard deviation of y.

(c) Suppose that the amount of time one spends in a bank to withdraw cash from an evening counter is exponentially distributed with mean ten minutes, that is $\lambda = 1/10$. What is the probability that the customer will spend more than 15 minutes in the counter ? 4

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