No. of Printed Pages : 5

MCSE-004

MCA (Revised)

Term-End Examination 09427

June, 2013

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) Explain briefly what are the sources of error ? Verify the associative property for the floating point numbers. i.e. prove : **4+4**

$(a+b)-c \neq (a-c)+b$, where $a = .5665E1$, $b = .5556E-1$ and $c = .5644E1$

(b) Find the root correct to three decimal places using Regula - Falsi method $x^4 - x - 10 = 0$. 8

(c) Solve the following system of equations 8

$4x_1 + x_2 + x_3 = 4$

$x_1 + 4x_2 - 2x_3 = 4$

$3x_1 + 2x_2 - 4x_3 = 6$

By the Gauss Elimination method with partial pivoting.

(d) Find the unique polynomial $P(x)$ of degree 2 or less such that 8

$P(1) = 1,\ P(3) = 27,\ P(4) = 64$

Using Lagrange interpolation formula.

(e) Calculate the value of the integral 8

$$\int_4^{5.2} \log x \, dx$$

by

(i) Trapezoidal rule

(ii) Simpson's $\frac{1}{3}$ rule

2. (a) Find all the roots of $\cos x - x^2 - x = 0$ to five decimal places. 8

(b) Solve the following system of equations 8

$x + y - z = 0$

$-x + 3y = 2$

$x - 2z = -3$

By Gauss - Seidel method. Write its matrix form.

(c) Write the pitfalls in the Gauss Elimination Method. 4

3. (a) In the table below the values of y are consecutive terms of a series of which the number 21.6 is the 6^{th} term. Find the First and tenth terms of the series. 8

x	3	4	5	6	7	8	9
y	2.7	6.4	12.5	21.6	34.3	51.2	72.9

(b) Evaluate the integral $\int_1^4 x^2 dx$ using Weddle's rule with $h=0.5$ 5

(c) Given $\frac{dy}{dx} = y - x$ Where $y(0)=2$

Find $y(0.1)$ and $y(0.2)$ correct to four decimal places using Runge-Kutta Second Order Method. 7

4. An experiment consist of three independent tosses of a fair coin. 8

(a) Let x = the no. of heads

y = the no. of head runs

z = the length of head runs

a head run being defined as consecutive occurance of at least two heads, its length then being the number of heads occuring together in three tosses of the coin. Find the probability function of

(i) x, (ii) y,

(iii) z (iv) $x+y$

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

Variance of $x = 9$

Regression Equations

$$8x - 10y + 66 = 0$$

$$40x - 18y = 214$$

What are :

(i) The mean values of x and y

(ii) The correlation coefficient between x and y.

(iii) The standard deviation of y ?

(c) A bag contains 6 white and 9 black balls .Four balls are drawn at a time. Find the probability for the first draw to give 4 white and the second to give 4 black balls in each of the following cases : 4

(i) The balls are replaced before the second draw.

(ii) The balls are not replaced before the second draw.

5. (a) Solve the initial value problem to compute approximation for $y(0.1)$, $y(0.2)$ using Euler's material with $h = 0.1$ **10**

$$\frac{dy}{dt} + 2y = 3e^{-4t}, y(0) = 1$$

Compare with exact solution

$$y(t) = \frac{5e^{-2t} - 3e^{-4t}}{2}$$

(b) Evaluate the integral $I = \int_0^1 \frac{dx}{1+x}$ using **10**

(i) Composite trapezoidal rule

(ii) Composite simpson's rule with 2, 4 and 8 equal subintervals.