

**MCA (Revised)**  
**Term-End Examination**

**December, 2017**

07140

**MCSE-004 : NUMERICAL AND STATISTICAL  
COMPUTING**

*Time : 3 hours*

*Maximum Marks : 100*

**Note :** *Question no. 1 is compulsory. Attempt any three questions from the rest. Use of calculator is allowed.*

1. (a) Evaluate the sum  $S = \sqrt{7} + \sqrt{5} + \sqrt{3}$  to 4 significant digits and find its absolute and relative errors. 5

(b) Use Lagrange's Interpolation formula to find the value of  $\sin(\pi/6)$  given by  $y = \sin x$ . 5

x	0	$\pi/4$	$\pi/2$
$y = \sin x$	0	0.70711	1.0

(c) Determine the value of  $y$  when  $x = 0.1$ . Given that  $y(0) = 1$  and  $y' = x^2 + y$ . Use Euler's method. 5

(d) What are the pitfalls of Gauss Elimination method ? 5

(e) Evaluate  $\frac{\Delta^2}{E}(x^3)$ . 5

(f) An individual's IQ score has a Normal distribution  $N(100, 15^2)$ . Find the probability that the individual's IQ score is between 91 and 121. 5

(g) Use Regula-Falsi method to find the roots of the equation  $f(x) = x^3 + x - 1$ . 5

(h) Calculate the value of the integral  $\int_4^{5.2} \log x \, dx$  by using

(i) Simpson's 1/3 rule,

(ii) Simpson's 3/8 rule. 5

2. (a) Using the data given below, perform the following tasks : 10

	Subject A	Subject B
Mean Marks	36	85
Standard Deviation	11	8

Coefficient of correlation between A and  
B =  $\pm 0.66$ .

- (i) Determine the two equations of regression.
- (ii) Calculate the expected marks in A corresponding to 75 marks obtained in B.

- (b) Using the Runge-Kutta method, find  $y(0.2)$  for the equation  $\frac{dy}{dx} = \frac{y-x}{y+x}$ ;  $y(0) = 1$ .

Take  $h = 0.2$ .

10

3. (a) Solve the following system of equations by using the Gauss Elimination method :

6

$$x + 2y + z = 3$$

$$2x + 3y + 3z = 10$$

$$3x - y + 2z = 13$$

- (b) Solve the following system of equations by using the LU decomposition method :

6

$$x + y = 2; \quad 2x + 3y = 5$$

- (c) Use the Jacobi method to solve the following system of equations : 8

$$3x + 4y + 15z = 54.8$$

$$x + 12y + 3z = 39.66$$

$$10x + y - 2z = 7.74$$

4. (a) A thesis contains 100 misprints distributed randomly throughout its 100 pages. What is the probability that a page observed at random contains at least two misprints ? 5
- (b) The tangent of the angle between the lines of regression  $y$  on  $x$  and  $x$  on  $y$  is 0.6 and  $\sigma_x = \frac{1}{2} \sigma_y$ . Find  $r_{xy}$ . 5
- (c) A polynomial passes through the points (1, -1), (2, -1), (3, 1) and (4, 5). Find the polynomial using Newton's forward interpolation. 5
- (d) Find an approximate value of the root of the equation  $x^3 + x - 1 = 0$ , near  $x = 1$ , using the Bisection method twice. 5

5. (a) Discuss the formulas for the following : 6

(i) Binomial distribution

(ii) Poisson distribution

(iii) Normal distribution

(b) If a bank receives on an average  $\lambda = 6$  bad cheques per day, what is the probability that it will receive 4 bad cheques on any given day ? 6

(c) Given the values

x	f(x)
5	150
7	392
11	1452
13	2366
17	5202

Evaluate  $f(9)$  using

- (i) Lagrange's formula, and  
(ii) Newton's divided difference formula. 8