

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
**(END SEMESTER EXAMINATION)**

CLASS: MCA  
BRANCH: MCA

SEMESTER : I  
SESSION : MO/2013

SUBJECT: MCA1003 - NUMERICAL AND STATISTICAL METHODS

TIME: 3 HOURS

FULL MARKS : 60

**INSTRUCTIONS:**

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Steam Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Explain Newton Raphson method. When does this method fail? [6]

(b) Find a real root of the equation  $x^3 - 2x - 5 = 0$  using bisection method. [6]

Q.2(a) Define the operators  $\Delta$ ,  $\nabla$  and  $E$ . Show that  $\Delta \equiv E \nabla$ . [6]

(b) The population of a town in the decennial censuses was as given below. Estimate the population for the year 1895: [6]

Year (x)	: 1891	1901	1911	1921	1931
Population (y) in thousand	: 46	66	81	93	101

Q.3(a) Evaluate  $\int_0^{\pi} t \sin t \, dt$  using Trapezoidal rule. [6]

(b) Explain Simpson's 1/3 rd rule, stating its assumption clearly. [6]

Q.4(a) Distinguish between Jacobi method and Gauss Seidel method for solving a set of simultaneous linear equation. Does the convergence of Jacobi imply the convergence of Gauss Siedel or vice versa? [6]

(b) Solve the following using Gauss Siedel method [6]

$$83x + 11y - 4z = 95$$

$$7x + 52y + 13z = 104$$

$$3x + 8y + 29z = 71$$

Q.5(a) If  $P(A \cup B) = \frac{5}{6}$ ,  $P(A \cap B) = \frac{1}{3}$  and  $P(A^c) = \frac{1}{2}$ . Prove that A and B are independent events. [6]

(b) Prove that  $E(x + y) = E(x) + E(y)$  [6]

Q.6(a) If x and y are independent Poisson variation such that  $P(x = 1) = P(x = 2)$  and  $P(y = 2) = P(y = 3)$  find the variance of  $x - 2y$ . [6]

(b) The probability of a man hitting a target is  $\frac{\lambda}{4}$ . If he fires 7 times, what is the probability of his hitting the target at least twice? [6]

X Q.7(a) Distinguish between null hypothesis and alternative hypothesis, parametric and non-parametric hypothesis, type I and type II errors clearly. [6]

X (b) In a random sample of 1000 people in a certain state, 540 are found to be rice eaters and the rest wheat eaters. Can be assume that both rice and wheat are equally popular in this state? Test at 5% level of significance. [6]