Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/MCA/SEM-3/M(MCA)-301/2010-11

2010-11

STATISTICS & NUMERICAL TECHNIQUE

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) The A.M. of 2, 4, 6, ..., $2n$ is

a) $(n + 1) / 2$ b) $n (n + 1)$

c) $n + 1$ d) $n (n + 1) / 2$.

ii) The s.d. of the following observation 5, 7, 1, 2, 6, 3 is

a) 4·66 b) 2·16

c) 1·47 d) none of these.

iii) The probability that a year selected at random will contain 53 Sundays is

a) 1/52 b) 1/7

c) 2/7 d) 1/53.

iv) When the variance of a random variable is 2/.3, the Var ($3x + 5$) is

a) 8 b) 2

c) 11 d) none of these.

v) The bisection method of finding roots of non-linear equations falls under the category of a (an) .... method.

a) open b) bracketing

c) graphical d) random.

vi) The next iterative value of the root $x^2 - 4 = 0$ using Newton-Raphson method, if the initial guess is 3, is

a) 1·500 b) 2·066

c) 2·167 d) 3·000.

vii) Lagrange's interpolation formula is used for

a) equally spaced arguments

b) unequally spaced arguments

c) unequally or equally spaced arguments

d) none of these.

viii) The third divided difference with arguments a, b, c and d is equal to

a) $1/abcd$ b) $-(1/abcd)$

c) ad/bc d) none of these.

ix) For a distribution, mean, median and mode are found to be equal. What kind of distribution is the most possibility ?

a) Binomial b) Poisson

c) Normal d) Geometric.

x) The truncation error in Composite Trapezoidal Rule is

a) h^2 b) h^3

c) h^4 d) none of these.

xi) One of the iterative methods by which we can find the solution of simultaneous system of linear equations is

a) Gauss Elimination Method

b) Gauss – Jordan Method

c) LU Factrorization Method

d) Gauss-Seidel Method.

xii) A and B are events with $P(A) = 1/3$, $P(B) = 2/5$, $P(AB) = 2/15$. Are A and B independent ?

a) True b) False.

GROUP – B
(Short Answer Type Questions)
Answer any *three* of the following. $3 \times 5 = 15$

2. Find the missing frequencies in the following frequency distribution, when it is known that A.M. = 11·09 and total frequency = 60 :

Class limits :	9·3-9·7	9·8-10·2	10·3-10·7	10·8-11·2	11·3-11·7	11·8-12·2	12·3-12·7	12·8-13·2
Frequ-ency	2	5	f_3	f_4	14	6	3	1

3. Evaluate $\int_0^1 (4x - 3x^2)\, dx$ taking 10 intervals, by Simpson's one-third rule.

4. Using method of false position, find the real root of the equation

$$f(x) = x^3 - 3x - 5 = 0 \text{ up to 4 decimal places.}$$

5. Write down the formula for Trapezoidal rule. What is the geometrical interpration.?

6. Prove that if E_1 and E_2 be two mutually statistically independent events, then $P(E_1 \cap E_2) = P(E_1) P(E_2)$.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Prove that $E = e^{hD}$, where E is the shift operator and D is the differential operator.

b) From the following table express y as a function of x, and then find y at $x = 0{\cdot}5$.

x	0	1	2	3	4
y	3	6	11	18	27

c) Compute $\int_1^{1{\cdot}5} e^x \, dx$ using Simpson's one-third rule taking 10 subintervals. Solution should be correct up to 5 decimal places.

2 + 6 + 7

8. a) Prove that $P\left(A^{c}\right) = 1 - P(A)$, where A^{c} implies complement of the event A.

b) Find the probability of getting exactly two even numbers when a balanced die is rolled thrice.

c) Prove that for a Binomial distribution, mean is greater than variance. 4 + 5 + 6

9. a) Apply Euler's method to find y at $x = 0{\cdot}01$ and $0{\cdot}02$ from $\frac{dy}{dx} = y + e^{x}$ with $y(0) = 0$.

b) Use Gauss Elimination to solve

$$3x - 2y + 2z = 12$$

$$x + 2y + 3z = 11$$

$$2x - 2y - z = 3.$$

c) State and prove Baye's theorem. 6 + 5 + 4

10. a) Apply Runge-Kutta method to find an approximate solution of y at $x = 0{\cdot}2$ for $\frac{dy}{dx} = x + y^{2}$ given that $y(0) = 1$. Take step size equal to $0{\cdot}1$.

b) Find the cube root of 10 by Newton-Raphson method.

c) Find a real root of $x^{3} - x - 11 = 0$ using bisection method. Solution should be correct up to 1 decimal place. 6 + 5 + 4

11\. a) There are two boxes, the first containing 3 white and 7 black balls and the second containing 7 white and 3 black balls. One box is chosen at random and from it 2 balls are drawn without replacement. Find the probability that both the balls are white. Also, given that both the balls are white, find the conditional probability that the first ball was chosen.

b) Prove that in the limiting case, Binomial distribution tends to Poisson distribution.

c) Prove that for two events E_1 and E_2

$$P\left(E_1 \cup E_2\right) = P\left(E_1\right) + P\left(E_2\right) - P\left(E_1 \cap E_2\right).$$

5 + 5 + 5