Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MCA/SEM-3/M(MCA)-301/2009-10

2009

STATISTICS AND NUMERICAL TECHNIQUES

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) If the events A and B are independent, then which one is true ?

      a) $AB = A + B$

      b) $P(AB) = P(A) \cdot P(B)$

      c) $A \cap B = \phi$

      d) $P(AB) = P(A) + P(B)$.

   ii) If the events A and B are mutually exclusive, then which one is true ?

      a) $A \cap B = \phi$

      b) $A + B = \phi$

      c) $P(A) = P(B) = \phi$

      d) None of these.

iii) The relation among mean, median and mode of a normal distribution is given by

a) Mean ≥ Median ≥ Mode

b) Mean – Mode = 3 (Mean– Median)

c) Mean = Median = Mode

d) none of these.

iv) Given that the mean of a set of observations is 5 and its median is 11. What is the mode of the given set of observations ?

a) 20 b) 21

c) 22 d) 23.

v) The degree of linear association between X and Y is measured using

a) Pearson's correlation coefficient

b) Regression coefficient

c) Index number

d) none of these.

vi) If n values of $f(x)$ are given, then $f(x)$ can be approximated by a polynomial of degree

a) n b) $n - 1$

c) $n + 1$ d) none of these.

vii) Lagrange's interpolation formula is used for

a) qually spaced arguments

b) unequally spaced arguments

c) unequally or equally spaced arguments

d) none of these.

viii) Stirling's formula is the average of

a) Gauss's forward and backward formulae

b) Newton's forward and backward formulae

c) any one of these

d) none of these.

ix) The degree of approximating polynomial in Simpson's one third rule is

a) 3 b) 2

c) 1 d) any of (a), (b) & (c).

x) The mean of Poisson distribution is μ. Then its standard deviation is

a) $\frac{1}{\sqrt{\mu}}$ b) μ

c) $\frac{1}{\mu}$ d) $\sqrt{\mu}$.

xi) The equations of regression lines are $4x + 9y + 5 = 0$ and $x + 4y + 3 = 0$. The means $\bar{X}$ and $\bar{Y}$ of X and Y are

a) 1, – 1 b) 1, 0

c) 0, 1 d) – 1, – 1.

xii) The value of k for which

$$f(x) = kx(1-x),\ 0 < x < 1$$

$$= 0 \quad \text{otherwise}$$

will be the probability density function of a random variable X is

a) 6 b) 2

c) 1 d) 3.

xiii) In a binomial distribution with non-zero p and q

a) Mean > variance b) Mean = variance

c) Mean < variance d) Mean ≤ variance.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. The mean and s.d. of 20 items are found to be 10 and 2 respectively. At the time of checking it was found that one item 8 was incorrect. Calculate the mean and s.d. if

   i) the wrong item is omitted

   ii) it is replaced by 2.

3. State and prove Multiplication Theorem.

4. Find the mean and s.d. of the bionomial distribution with parameters n and p.

5. The p.d.f. of a continuous distribution of a random variable X is given by

$$f(x) = (3/4)\,x\,(2 - x),\ 0 < x < 2.$$

$$= 0, \text{ otherwise}$$

Compute mean and variance of X.

6. Using Lagrange's interpolation formula find the form of $y(x)$ from the following data :

x	0	1	3	4
$y(x)$	– 12	0	12	24

7. Using method of false position, find the real root of the equation $f(x) = x^3 - 3x - 5 = 0$ up to 4 decimal places.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. a) Establish Newton's backward interpolation formula.

   b) The table gives you values of tan X for $0{\cdot}10 \le x \le 0{\cdot}30$.

X	0·10	0·15	0·20	0·25	0·30
$Y = \tan X$	0·1003	0·1511	0·2027	0·2553	0·3093

   Find tan (0·12) 8 + 7

9. a) Establish the second order Runge-Kutta method.

   b) Establish $\sqrt{12}$ to 3 places of decimals by Newton-Raphson Method. 8 + 7

10. a) The following is a table of values of a polynomial of degree 5. It is given that $f(3)$ is in error. Correct the error.

X	0	1	2	3	4	5	6
Y	1	2	33	254	1025	3126	7777

b) Find A^{-1} if $A = \begin{bmatrix} 8 & -4 & 0 \\ -4 & 8 & -4 \\ 0 & -4 & 8 \end{bmatrix}$ by Gauss-Jordan method. 6 + 9

11. a) Compute dy/dx and d^2y/dx^2 at $x = 1{\cdot}5, 5{\cdot}8$ from the following table :

x	1	2	3	4	5	6
$y = f(x)$	1	8	27	64	125	216

b) Solve the following system of equations by LU – factorization method :

$3x + 4y + 2z = 15,\ 5x + 2y + z = 18,\ 2x + 3y + 2z = 10$

8 + 7

12. a) Use Rombert's method to compute $\int_0^1 dx/(1 + x^2)$ correct to 4 decimal places. Hence find the approximate value of π.

b) Check whether the following system of equations are diagonally dominant. If not, rearrange them and solve by Gauss-Seidel method.

$-2x + 3y + 10z = 22,\ x + 10y - z = -22,\ 10x + 2y + z = 9$

7 + 8

13. a) In the following data two class frequencies are missing :

Class-interval	(100-110)	(110-120)	(120-130)	(130-140)	(140-150)
Frequency	4	7	15	?	40
Class-interval	(150-160)	(160-170)	(170-180)	(180-190)	(190-200)
Frequency	?	16	10	6	3

Total number of frequencies is 150 and the median is 146·25. Find out the missing frequencies.

b) Find the mean and s.d. of the Poisson distribution with parameter *m*. 10 + 5