Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M. Tech (BT)/SEM-1/MBT-104/2011-12

2011

NUMERICAL ANALYSIS AND BIOSTATISTICS

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 coefficient for Simpson's 3/8 rule is

      a) 1/8 b) 3/8

      c) 9/64 d) 1/64.

   ii) Frequency distribution is a

      a) statistical table which shows the values of variables

      b) table which shows the values of variables arranged in order of magnitude

      c) statistical table which shows the values of variables arranged in order of magnitude

      d) statistical table which shows the values of variables within a range.

iii) "Goodness of fit" is another name for

a) Chi-square analysis b) T test

c) F test d) Anova.

iv) Runge-Kutta method is a derivative of

a) Taylor's series b) Euler's series

c) Simpson's rule d) None of these.

v) ..... is a circular graph whose area is subdivided into sectors by radii in such a way that the areas of sectors are proportional to the angles at the centres.

a) Pie diagram b) Bar diagram

c) Pictogram d) Histogram.

vi) In case of contingency chi-square, the degree of freedom is calculated by

a) (R–1) (C–1) b) $n - 1$

c) both of these d) none of these.

vii) What is the value of y when $x = 0{\cdot}2$, for the differential equation $dy/dx = x + y$, when $y = 1$ at $x = 0$?

a) 0·2428 b) 1·2428

c) 1·3 d) 0·3.

viii) Event is known as

a) The result of an experiment in all possible forms

b) The result of natural phenomenon in all possible forms

c) A set of samples happening with time

d) All of these.

ix) ..... provides a statistical test of whether or not the means of several groups are all equal.

a) Chi-square analysis b) T test

c) F test d) Anova.

x) Range is the difference between

a) The value of smallest item and the largest included in the mode

b) The value of smallest item and the largest distributed in the set

c) The two values of the list

d) The value of smallest item and the largest distribution divided by the total number of the frequencies.

xi) Simpson's 1/3 rule is obtained by putting n = ... in Newton-Cote's Quadrature formula.

a) 2 b) 3

c) 1/3 d) 3/8.

xii) Attributes are known as

a) non-measurable characteristics which can be numerically expressed

b) measurable characteristics which can be numerically expressed

c) measurable quantities which can be numerically expressed

d) non-measurable quantities which can be numerically expressed.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following

$3 \times 5 = 15$

2. Evaluate $\sqrt{12}$ to four decimal places by Newton's iterative method. 5

3. The frequency distribution of weight in grams of a fruit variety is given below. Calculate the mean and the median.

Weight in gram	No. of fruits	Weight in grams	No. of fruits
410-419	14	450-459	45
420-429	20	460-469	18
430-439	42	470-479	7
440-449	54	480-489	9

5

4. The mean IQ of sample of 1600 children was 99. It is likely that this was a random sample from a population with mean IQ 100 and standard deviation 15. Given that $Z\alpha$ at 5% level is 1·96. 5

5. The velocity v of a particle at distance s from a point on its path is given by the table :

s ft	0	10	20	30	40	50	60
v ft/sec	47	58	64	65	61	52	38

Estimate the time taken to travel 60ft by using Simpson's 1/3 rule. 5

6. Two samples were drawn from two normal populations and their values are :

A	66	67	82	75	76	90	92	88	84		
B	66	64	78	74	87	85	82	95	93	97	92

Test whether the two populations have the same variance at 5% level of significance. Given that F at 0·05 for the df 10 and 8 is 3·35. 5

GROUP – C

(Long Answer Type Questions)

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

7. Apply Gauss-Jordan method to solve the equations $x + y + z = 9$; $2x - 3y + 4z = 13$; $3x + 4y + 5z = 40$. 15

8. a) The number of bacteria in 1ml. of blood from 5 persons are 2, 3, 7, 8, 10. Find out the distribution nature.

   b) A candidate is selected for interview for three posts. Find the first there are three candidates, for the second there are four and for the third there are two. What are the chances of his getting at least one ?

   c) Find the 45th and 57th percentiles of the following data on marks obtained by 100 students in a subject.

   4 + 5 + 6

9. a) Distinguish between one-way and two-way ANOVA.

b) The following data give the yields on 12 plots of land in three samples under three varieties of fertilizers :

A	B	C
25	20	24
22	17	26
24	16	30
21	19	20

Is there any significant difference in the average yields of land under the three varieties of fertilizers ? Given that F at df (2, 9) at 5% level = 4·26.

c) Crossing of purple eyed straight winged Drosophila with red eyed curved wing one produced dihybrid red eyed straight winged females in F_1. On crossing such F_1 females with double recessive purple eyed curved winged males gives the following phenotypes : Red eyed straight wing 339, purple eyed straight wing 612, red eyed curved wing 725, purple eyed curved wing 348. Find out whether or not F_2 generation obey the test cross ratio ? Critical χ^2 value at df 3 at 0·05 is 3·82.

3 + 6 + 6

10. The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface :

X = height	100	150	200	250	300	350	400
Y = distance	10·63	13·03	15·04	16·81	18·42	19·90	21·27

Find the values of y when x = 218 ft. 15

11. a) What is probability ?

b) Explain the theorems on probability.

c) A bag contains 5 white and 8 red balls. Two drawing of 3 balls are made such that :

i) Balls are replaced before the second trial,

ii) The balls are not replaced before the second trial. Find the probability that the first drawing will give 3 white and the second red balls in each case.

d) In a certain manufacturing process, 5% of the tools produced turn out to be defective. Find the probability that in a simple of 40 tools utmost 2 will be defective. (Give that $e^2 = 0 \cdot 135$) 2 + 4 + 6 + 3

12. a) What do you mean by paired and unpaired *t* tests ?

b) Ten students were given intensive coaching in statistics. The scores obtained in 1st and 5th test are given below.

Marks in 1st	50	52	53	60	65	67	48	69	72	80
Marks in 5th	65	55	65	65	60	67	49	82	74	86

Does the score from 1st test to 5th test show an improvement ? Critical values of *t* at 0·05 for 9 *df* is 1·833.

c) Application of fertilizers was tested for the yield of rice grown in 10 plots. Another seed of 10 plots of similar size and condition was taken as control.

With Fertilizer	16	14	18	15	13	17	16	15	14	13
Without Fertilizer	10	12	11	9	13	13	12	14	13	11

Test the effect of fertilizer. Tabulated value of *t* at 0·05 for *df* 20 is 2·10. 3 + 6 + 6