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.

Graph sheet(s) will be supplied by the institution on demand.

GROUP – A
(Multiple Choice Type Questions)

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

   i) Method of Random sampling is a process of selecting individual items from the population
      a) haphazardly
      b) as per wish of investigator
      c) giving every item of population an equal chance to be chosen
      d) none of these.

   ii) If data on blood group of 8 persons are A, O, AB, O, B, B, O, A, B, AB, then this type of data is called
      a) Quantitative b) Qualitative
      c) Fictitious d) None of these.

iii) When statistical methods are applied in biological activities, that is called

a) Psychometrics b) Bio-statistics

c) Demography d) None of these.

iv) To reveal correlation between two variables if any, the diagram plotted is called

a) Cartogram b) Scatter diagram

c) Histogram d) Line graph.

v) Which one of the following is not the measure of dispersion ?

a) Coefficient of variations

b) Range

c) Coefficient of regression

d) Standard deviation.

vi) If X follows Poisson distribution with parameter $\mu = 4{\cdot}41$, then its standard deviation is

a) $2{\cdot}1$

b) $1/2{\cdot}1$

c) $4{\cdot}41$

d) none of these.

vii) If α and β are probabilities of type-I error and type-II error respectively then the power of test is

a) $1 - \alpha$ b) β

c) α d) $1 - \beta$.

viii) To test the difference between average yields of several varieties of rice the appropriate test would be

a) χ^2-test b) F-test

c) ANOVA d) Z-test.

ix) If $f(x)$ is a polynomial of degree 3, then its third difference is

a) constant b) zero

c) 3 d) none of these.

x) The iterative method of solving a linear system of equation is

a) Gauss - Jordan method

b) Gauss elimination method

c) Gauss-Seidel method

d) None of these.

xi) Which of the following relations is true ?

a) $E = \Delta - 1$ b) $E = \Delta + 1$

c) $E = 1 - \Delta$ d) $\Delta E = 1$.

xii) If multiple correlation coefficient $R = 0{\cdot}9$ between dependant variable Y and two independent variables X_1 and X_2, then the variance explained by regression equation $Y = aX_1 + bX_2 + c$ is

a) 90 % b) 10%

c) 81 % d) 100 %.

xiii) If $f(x)$ is a polynomial degree n and $\Delta^k f(x)$ = constant, then the value of K is

a) $(n + 1)$ b) $(n - 1)$

c) n d) none of these.

xiv) When Gauss-elimination method is used to solve linear equations $AX = B$, the matrix A is transformed to a/an

a) null matrix

b) upper triangular matrix

c) identity matrix

d) diagonally dominant matrix.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following

$3 \times 5 = 15$

2. From the following data on grain length of two varieties of rice, *A* and *B*, determine which variety has greater variability :

	Variety A	**Variety B**
Mean grain length (mm)	14·8	15·4
Variance (sq. mm)	7·56	6·73

3. Draw a histogram to represent marks of 60 students in Bio-statistics.

Class-intervals (Marks) :	0-5	6-10	11-15	16-20	21-25	26-30
Frequency (No. of students):	3	7	12	18	15	5

4. Apples are transported in boxes by packing 200 apples in each box. On an average 2% of apples get damaged during transportation. What is the probability that (a) there is no damaged apple in a box (b) at most 2 damaged apples may be found in a box ?

5. The theory supports that the proportion of beans available in 4 groups *A*, *B*, *C*, *D* should be 9 : 3 : 3 : 1. In an experiment with 16 beans the numbers in 4 groups were as follows :

Groups :	***A***	***B***	***C***	***D***
Nos. observed :	882	313	287	118

Using χ^2-test verify whether the result support the theory. Given $\chi^2_{0\cdot05} = 7\cdot851$ for 3d.f.

6. Using Newton's forward difference formula find equation of polynomial $Y = f(x)$ where

X :	0	1	2	3	4	5
Y :	1	4	9	16	25	36

GROUP – C

(Long Answer Type Questions)

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

7. 10 varieties of wheat are sown in 3 plots, wherein 3 types of fertilizers are used. The following yields in quintals per acre are obtained.

Variety of wheat

Fertilizers	1	2	3	4	5	6	7	8	9	10	Total
1	7	7	14	11	9	6	9	8	12	9	92
2	8	9	13	10	9	7	13	13	11	11	104
3	7	6	16	11	12	5	12	11	11	11	102
											298

Test the significance of difference between

a) 10 varieties of wheat

b) 3 types of fertilizers.

Given 99 % confidence value of F with (2, 18) d.f. is 6·01 and with (9, 18) d.f. is 3·60.

8. a) Solve the following system of linear equations using Gauss-Jordan Method.

$X + Y + 2Z = 8$

$-X - Y + 3Z = 1$

$3X - 7Y + 4Z = 1$

b) Determine eigenvalue of matrix A = $\begin{pmatrix} 3 & 1 & -1 \\ 2 & 2 & -1 \\ 2 & 2 & 0 \end{pmatrix}$

whose eigenvector is (1, 1, 2). 10 + 5

9. a) From a normal population a sample of size 900 items is drawn and sample mean and S.D. were 3·4 cm and 2·61 cm respectively. Can sample be regarded as drawn from a population with a mean = 3·25 cm. Given critical value of Z = 1·96 for 95 % confidence level.

Also determine 95 % confidence limits for population mean.

b) A drug was given to 10 patients and increase in their blood pressure was recorded as follows :

3, 6, – 2, 4, – 3 4, 6, 0, 0, 2.

Test the hypothesis that drug has no effect on change of blood pressure (Given 5% value of t = 2·26 for 9 d.f.)

9 + 6

10. a) Determine the regression equation of rice on water based on following data for 10 experiment plots :

Water level in inches (x)	12	18	24	30	36	42	48
Yield in tons per acre (y)	5·3	5·7	6·3	7·2	8·0	8·7	8·4

Also estimate the expected yield of rice for 40 inches of water.

b) In a study on relationship between two variables X and Y, the coefficient of correlation is 0·8. The mean and S.D. are as follows :

	X	Y
Mean	65	67
S.D.	2·5	3.5

Find the regression equations for Y on X and also for X on Y. 9 + 6

11. a) Ten students are selected for a training programme and their scores before and after training programme is ranked as under :

Students	1	2	3	4	5	6	7	8	9	10
Ranked before training	1	4	10	8	5	7	3	2	6	9
Ranked after training	2	3	3	10	5	6	1	4	7	8

Determine Spearman's rank correlation. Test whether the association between pre-training and post-training ranks is statistically significant. Given critical value of r for n = 10 at 95 % level of significance is 0·6364.

b) In testing of hypothesis explain the following :

i) Type – I error

ii) Type – II error

iii) Power of the test. 10 + 5