



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  $\mu = 4.41$ , then its standard deviation is
- a) 2.1  
b)  $1/2.1$   
c) 4.41  
d) none of these.
- vii) If  $\alpha$  and  $\beta$  are probabilities of type-I error and type-II error respectively then the power of test is
- a)  $1 - \alpha$                       b)  $\beta$   
c)  $\alpha$                       d)  $1 - \beta$ .
- viii) To test the difference between average yields of several varieties of rice the appropriate test would be
- a)  $\chi^2$ -test                      b) F-test  
c) ANOVA                      d) Z-test.

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**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 :

	<b>Variety A</b>	<b>Variety B</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 :

<b>Groups</b>	:	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>Nos. observed</b>	:	882	313	287	118

Using  $\chi^2$ -test verify whether the result support the theory.

Given  $\chi^2_{0.05} = 7.851$  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	<u>102</u>

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Test the significance of difference between

- 10 varieties of wheat
- 3 types of fertilizers.

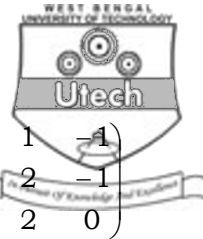
Given 99 % confidence value of  $F$  with ( 2, 18 ) d.f. is 6.01 and with ( 9, 18 ) d.f. is 3.60.

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.)

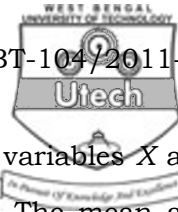
9 + 6

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
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Yield in tons per acre ( $y$ )	5.3	5.7	6.3	7.2	8.0	8.7	8.4
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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 :
- Type – I error
  - Type – II error
  - Power of the test. 10 + 5