Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech (BT)/SEM-1/MBT-104/2010-11

2010-11
MATHEMATICS 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) Variance is a relative measure of dispersion

a) does not bear the unit of raw scores

b) bears the secured unit of raw scores

c) bears the same unit as that of raw scores

d) bears the fractional unit of that raw scores.

ii) Standard deviation is worked out as the

a) square root of the sum of squares

b) square root of the mean square

c) square root of the sum of absolute deviations of the scores from the man

d) multiplication of the values.

iii) Median is defined as the

a) middle most value of the variable in a set of observations

b) the observation in central after they are arranged in a suitable order

c) the observation in central without they are arranged in a suitable order

d) middle most value of the variable in a set of observations after they are arranged in a suitable order.

iv) Find out the correct relationship among mean, median, mode

a) median = 3 mode – 2 mean

b) mode = 3 median – 2-mean

c) mode = 2 median – 3 mean

d) mean = 2 mode.

v) In ..... distribution the number of trials '*n*' should be finite and small.

a) Poisson b) Binomial

c) Probability d) Distribution.

vi) A statistical test to determiner if the "observed" numbers deviate from those "expected" numbers under a particular hypothesis is called a

a) Chi-square analysis b) *T* test

c) *F* test d) Anova.

vii) 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.

viii) Two-way Anova involves

a) two dependent variables

b) two independent variables

c) one dependent and one independent variables

d) none of these.

ix) $\Delta^3 y_0$ is equal to

a) $\Delta^2 y_1 - \Delta^2 y_0$ b) $\Delta y_1 - 2\Delta y_1 + \Delta y_0$

c) $y_3 - 3y_2 + 3y_1 - y_0$ d) All of these.

x) For Traphezoidal rule the value of n is

a) 1 b) 2

c) 3 d) None of these.

xi) In general $X_1 = X_0 + nh$, n and h are respectively

a) length of interval, number of interval

b) number of interval, length of interval

c) frequency of interval, frequency

d) none of these.

xii) Simpson's 3/8 rule preordains that the frequency of intervals should be multiple of

a) 1 b) 2

c) 3 d) 5.

GROUP – B

(Short Answer Type Questions)

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

2. Blood pressure of a patient of 100 days are given below :

B.P (mm Hg)	102	106	110	114	118	122	126
No. of days	3	9	25	35	17	10	1

Calculate the mean and standard deviation of the above data.

3. 120 patients were tested their blood for total cholesterol from two pathology laboratories *A* and *B*. The following results were obtained. (in mg/ml)

Laboratory *A* : Mean = 46·83; Mode = 51·67; S. D. = 14·8

Laboratory *B* : Mean = 47·83; Mode = 47·07; S. D. = 14·8

Determine the results of which of them is more asymmetry (skewed). Justify you answer.

4. A college conducts both day and night classes which are intended to be identical.

A sample of 100 day students yields examination results as under :

$\overline{X}_1 = 72 \cdot 4$ and $\delta_1 = 14 \cdot 8$

A sample of 200 night students yields examination results as under :

$\overline{X}_2 = 73 \cdot 9$ and $\delta_2 = 17 \cdot 9$.

Are the two means statistically equal at 10% level ? Given $Z\alpha$ at 10% level is 1·645.

5. The standard deviations calculated from two random samples of sizes 9 and 13 are 2·1 and 1·8 respectively. May the samples be regarded as drawn from the normal populations with the same SD ? The 5% value of F form the tables with df 8 and 12 is $F_{0\cdot05} = 2\cdot85$.

6. Find by Newton's method, the real root of the equation $3x = \cos x + 1$.

7. Find the value of $\int_1^2 \frac{dy}{x}$ by Simpson's rule. Hence obtain approximate value of $\log e^2$.

8. Apply Runge – Kutta method to find an approximate value of y for x = 0·2 in steps of 0·1, if $\frac{dy}{dx} = x + y^2$, given that y = 1, where x = 0.

GROUP – C

(Long Answer Type Questions)

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

9. a) Define distribution.

   b) Define Poisson distribution.

   c) Mention the characteristics of Poisson distribution.

   d) Assuming that the typing mistakes per page committed by a typist follows a Poisson distribution, find the expected frequencies for the following distribution of typing mistakes : (value of $e^{-1\cdot5} = 0\cdot22313$).

No. of mistakes per page	0	1	2	3	4	5
No. of page	40	30	20	15	10	5

2 + 2 + 3 + 8

10. a) Suppose that it is 11 to 5 against to a person who is now 38 years of age living till he is 73 and 5 to 3 against *B* now 43 living till he is 78 years. Find the chance that at least one of these persons will be alive after 35 years.

b) The probability that a student passes a Physics test is (2/3) and the probability that he passes both physics and English test is (14/15). The probability that he passes at least one test is (4/5). What is the probability that the student passes the English test ?

c) Find the median of the blood samples :

Glycerides (mg/dl)	20-30	30-40	40-50	50-60	60-70
Patients	5	10	20	5	3

5 + 6 + 4

11. a) Differentiate between one-way and two-way ANOVA.

b) The following data give the yields on 12 plots of land in three samples under three verities 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) The following table gives the classification of 100 workers according to sex and the nature of work. Justify whether the nature of work is independent of the sex of the work.

	Skilled	Unskilled
Male	40	20
Female	10	30

Table value of chi-square at *df* 1 at 5% level = 3·84.

3 + 6 + 6

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

b) An IQ test was administered to 5 persons before and after they were trained. The results are given below :

Candidates	I	II	III	IV	V
IQ before training	110	120	123	132	125
IQ after training	120	118	125	136	121

Test whether there is any change in IQ after the training programme. It is given that $t_{0\cdot01} = 4\cdot6$ for df 4.

c) Body length of fishes of a species was obtained from two ponds. They were measured as follows (in cm):

Pond A	20	24	20	28	22	20	24	32	24	26
Pond B	12	10	8	10	6	4	14	20	10	6

Calculate the mean difference in total body length between the two ponds of fish is significant or not. Tabulated value of t at 0·05 for df 18 = 2·1. 3 + 6 + 6

13. Using modified Euler's method, find an approximate value of y when $x = 0\cdot3$, given that $\frac{dy}{dx} = x + y$ and $y = 1$ when $x = 0$.

14. Apply Gauss-Jordan method to solve the equations :

$x + y + z = 9$;

$2x - 3y + 4z = 13$;

$3x + 4y + 5z = 40$.