End Semester Examination of Semester–III, 2015
Subject : MATHEMATICS (HONS.) (UG)
Paper : VIII (Theory)
Full Marks : 40
Time : 2 Hrs

The figures in the margin indicate the marks corresponding to the question.

Candidates are requested to give their answers in their own word as far as practicable.

Illustrate the answers wherever necessary.

Probablity

Group A

1. Answer **any one** out of two questions :   10X1=10

   a) i)   Define random variable and its distribution function. Two points are independently chosen at random in the interval (–1, 1). Find the probability that the three parts into which the interval is divided can form the sides of a triangle.   1+1+3

   ii) State and prove Bayes Theorem.   5

   b) State and prove Tchebychefff's Inequality over random variables.   3+7

2. Answer **any one** out of two questions :   6×1=6

a) Let the joint probability density function of X and Y be given by

$$f(x, y) = \begin{cases} x^2 + \dfrac{xy}{3}, & \text{if } 0<x<1,\ 0<y<2 \\ 0, & \text{elsewhere} \end{cases}$$

find the least square regression lines of the joint distribution of X and Y.

b) Define median of a distribution. Prove that the first absolute moment about any point is minimum when taken about the median.   2+4

Group B (Statistics)

3. Answer **any one** out of two questions :   10×1=10

a) i) Distinguish between distribution of a population and distribution of a sample. "Distribution of a sample is the statistical image of the distribution of the population" — explain explicitly.   4

ii) For a normal (m, σ) population show that $\dfrac{\sqrt{n}\,(\overline{x}-m)}{s}$ is t distributed with (n − 1) degrees of freedom. Where n is the sample size, $s^2 = \dfrac{n}{n-1}s^2$, s^2 is the sample variance respectively.

6

b) What do you mean by estimate and estimator? Find maximum likelihood estimate of the parameter μ of Poisson-μ population.

The heights of 10 males of a normal population are found to be 70, 67, 62, 67, 61, 68, 70, 64, 65, 66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% significance level assuming that for 9 degrees of freedom $P(t > 1.83) = 0.05$.

4. Answer **any one** out of two questions :   6×1=6

a) Fit a straight line trend for the following series and estimate the value for 1972 :

Year	1965	1966	1967	1968	1969	1970	1971
No. of production units	125	128	133	135	140	141	143

b) What do you mean by consumer price index number? Prepare consumer price index number from the following data for 1978 and 1979 taking 1977 as base year.

Group	Price in Rupees		
	1977	1978	1979
A	20.00	24.00	21.00
B	1.25	1.50	1.00
C	5.00	8.00	8.00
D	2.00	2.25	2.12

It is given that weights of the four groups are 4, 3, 2 and 1 respectively.   2+2+2

5. Answer **any four** out of eight questions :   2×4=8

   a) For a sample of size n from any population let be an unbiased estimate of population parameter θ and var(α)→0 as n→∞. Prove that α is a consistent estimate of θ.

   b) Define likelihood function of the sample size n. When the population random variables X is Continuous.

   c) If $r\dfrac{\sigma_y}{\sigma_x}=-1.2$, $r\dfrac{\sigma_x}{\sigma_y}=-0.3$ find correlation co-efficient r between x and y.

   d) Define the term "Population" and "Sample".

   e) What is best 'critical region' for testing a statistical hypothesis.

   f) Define confidence interval for the population parameter.

   g) Define and classify different types of Index numbers.

   h) Define time series : Explain its various components.

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