

2022
B.A./B.Sc.
First Semester
CORE – 1
STATISTICS
Course Code: STC 1.11
(Descriptive Statistics & Probability Theory)

Total Mark: 70

Pass Mark: 28

Time: 3 hours

Answer five questions, taking one from each unit.

UNIT-I

1. (a) Distinguish between nominal, ordinal and interval scales of measurement with the help of examples. 7
- (b) Write down any two definitions of statistics. 4
- (c) Discuss the scope of statistics. 3
2. (a) Write a note of the three different types of bar diagrams clearly explaining their differences and uses. 7
- (b) Explain how a frequency polygon is different from a histogram? 4
- (c) Why are diagrams and graphs extremely useful? 3

UNIT-II

3. (a) What are the properties of a good average/good measure of central tendency? 5
- (b) Examine these properties with reference to arithmetic mean, geometric mean and harmonic mean giving examples of situations in which each are appropriate measure for average. 9
4. (a) Write down how you can obtain quartile, decile and percentile from grouped data. 7
- (b) Show that the sum of deviations from arithmetic mean is zero 3
- (c) Show that the sum of absolute deviations from median is least. 4

UNIT-III

5. (a) What do you understand by skewness? How is it measured? How do you distinguish between positive and negative skewness? Show the relative positions of mean and median for positively and negatively skewed distributions. 7
- (b) What is standard deviation? How is it calculated for grouped and ungrouped data? 4
- (c) Show that standard deviation is independent of change of origin but not of scale. 3
6. (a) Define raw and central moments. Obtain the relation between the central moments of order r and raw moments. 7
- (b) Define Pearsonian coefficients β_1 and β_2 and briefly discuss their utility for determining skewness and kurtosis. 4
- (c) What is Sheppard's correction? What will be the correction for the second and third raw moments? 3

UNIT-IV

7. (a) Define the terms: random experiment, sample space, mutually exclusive events, independent events. $2+2+2+1=7$
- (b) If two dice are thrown, what is the probability that the sum is:
(i) greater than 8 $2+2=4$
(ii) neither 7 nor 11
- (c) State and prove the addition theorem of probability. 3
8. (a) A box contains 6 red, 4 white and 5 black balls. A person draws 4 balls from the box at random. Find the probability that among the balls drawn, there is at least one ball of each colour. 7
- (b) A problem in statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved if each of them try independently? 7

UNIT-V

9. (a) Define distribution function (or cumulative distribution function) and state its important properties. 7
- (b) Suppose that a discrete random variable X assumes three values 0, 1 and 2 with probabilities $\frac{1}{3}$, $\frac{1}{6}$ and c . Find the value of c . Hence or otherwise, obtain the distribution function of X . 7
10. (a) The joint probability density function of a two dimensional random variable (X, Y) is given by $f(x, y) = \begin{cases} 2, & 0 < x < 1, 0 < y < x \\ 0, & \text{otherwise} \end{cases}$
- Find the marginal probability density functions of X and Y . Also find the conditional distribution function of Y given $X=x$. Are X and Y independent? 2+2+2+1=7
- (b) A continuous random variable X follows the probability law $f(x) = ax^2, 0 < x < 1$. Find the following: 2+2=4
- (i) the value of a
- (ii) probability that x lies between 0.2 and 0.5
- (c) Distinguish between pmf and pdf. 3
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