October 2025
B.A./B.Sc.
First Semester
MAJOR – 1
STATISTICS
Course Code: STM 1.11
(Descriptive Statistics & Probability Theory)

Total Mark: 50 *Pass Mark: 20*
Time: 2 hours

I. Answer three *questions, taking* one *from each unit.*

UNIT–I

1. (a) What is tabulation? Describe the different components of a table. 1+4=5

   (b) Let X be a continuous random variable with p.d.f. 3+2=5

$$f(x)=\begin{cases} ax & ;\ 0\le x\le 1 \\ a & ;\ 1\le x\le 2 \\ -ax+3a & ;\ 2\le x\le 3 \\ 0 & ;\ \text{elsewhere} \end{cases}$$

   (i) Determine the constant a.
   (ii) Compute $P(X\le 1.5)$.

   (c) Discuss any two limitations of statistics. 2

2. (a) Define statistics. Discuss the importance and scope of statistics. 1+4=5

   (b) A random variable X has the following probability function:

Values of X:	0	1	2	3	4	5	6	7
$p(x)$:	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

   (i) Find k. 2
   (ii) Evaluate $P(X<6), P(X\ge 6)$ and $P(0<X<5)$. 2
   (iii) If $P(X\le a)>\frac{1}{2}$, find the minimum value of a 1

   (c) State the properties of distribution function. 2

UNIT -II

3. (a) What is median? How would you calculate median in case of a simple series, a simple frequency distribution, and a grouped frequency distribution? 1+5=6
   (b) Under what conditions is a distribution said to be skewed. 3
   (c) From the following group index numbers and their weights, ascertain the general index number: 3

Group:	I	II	III	IV	V	VI
Group Index:	118	120	97	107	111	93
Weight:	4	1	2	6	5	2

4. (a) Write short note on Sheppard's correction for moments. 3
   (b) Define Standard Deviation, clearly stating its different formulae. Also, give any two merits and two demerits. 4+2=6
   (c) A cyclist pedals from his house to his college at a speed of 10 kmph and back from the college to his house at 15 kmph. Find the average speed. 3

UNIT – III

5. (a) State Baye's theorem. A letter is known to have come either from TATANAGAR or from CALCUTTA. On the envelope just two consecutive letters TA are visible. What is the probability that the letter came from CALCUTTA? 2+3=5
   (b) Define independent events. Prove that if A and B are two events with positive probabilities $\{P(A) \neq 0, P(B) \neq 0\}$, then A and B are independent if and only if $P(A \cap B) = P(A).P(B)$. 2+3=5
   (c) Prove that probability of a null event is zero. 2

6. (a) What do you mean by conditional probability? From a city population, the probability of selecting a male or a smoker is $\frac{7}{10}$, a male smoker is $\frac{2}{5}$ and a male if a smoker is already selected is $\frac{2}{3}$. Find the probability of selecting
   (i) a non-smoker 2

(ii) a smoker, if a male is first selected 3

(b) Define axiomatic probability function. Discuss how the classical probability may be regarded as a special case of axiomatic probability. 2+3=5

(c) If *A, B* and *C* are mutually independent events then prove that $A \cup B$ and *C* are also independent. 2

II. Answer <u>any two</u> *of the following questions.*

7. Suppose that two-dimensional continuous random variable (X, Y) has joint p.d.f. given by

$$f(x,y) = \begin{cases} 6x^2 y & ; 0 < x < 1,\ 0 < y < 1 \\ 0 & ; \text{elsewhere} \end{cases}$$

(a) Verify that $\int_0^1 \int_0^1 f(x,y)dxdy = 1$. 2

(b) Find $P\left(0 < X < \frac{3}{4}, \frac{1}{3} < Y < 2\right)$. 2

(c) Find $P(X + Y < 1)$. 1

(d) Find $P(X < 1 \mid Y < 2)$. 2

8. Define partition values. Discuss the different types of partition values. 2+5=7

9. State and prove Boole's inequality. 2+5=7