Register Number:

Date:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE – 27

B.Sc STATISTICS – I SEMESTER

SEMESTER EXAMINATION – OCTOBER 2019

ST 118: INTRODUCTION TO PROBABILITY AND STATISTICS

Time: 2½ hrs **Max: 70 Marks**

This question paper has **TWO** printed pages and **THREE** parts

PART – A

I Answer any FIVE of the following: 5 x 3 = 15

1. Define following: (A) Statistics (B) Population (C) Sample
2. What is a boxplot? How is it useful?
3. Which average would you use in the following case:
   A) Temperature of a city
   B) Average size of shoes.
   C) If the workers of a factory are of different abilities, and their average income is to be found out.
4. Define Kurtosis? What are the different types of kurtosis?
5. A die is rolled and a coin is tossed, find the probability that the die shows an odd number and the coin shows a head
6. Let an experiment consist of tossing a fair coin three times. Let X denotes the number of heads which appear. Then the possible values of X are 0, 1, 2, 3 and corresponding probabilities are 1/k, 3/k, 3/k, and 1/k. Find k, Mean of X.
7. What do you understand by the term Correlation? What is the range of correlation coefficient?

PART – B

II Answer any FIVE of the following: 5 x 7 = 35

8. A) What are the different scales of measurement? Explain with an example. (5)
   B) If the arithmetic mean and geometric mean of two values are 5 and 4 respectively. Find the values? (2)
9. A) Find the mean and standard deviation of first N natural numbers. (5)
   B) Give the formula for combined variance with usual notations. (2)
10. A) If a, ar, ar^2, … , ar^{n-1} are the values of variable, derive the relation between Arithmetic mean, Geometric mean and Harmonic Mean (5)
    B) State the additive law and multiplicative law of probability (2)
11. A) Explain the procedure of calculating the Spearman's Rank Correlation. (4)
    B) Give the normal equations to fit quadratic curves. (3)
12. A) Define Probability Mass Function (2)
    B) Give any four properties of probability. Prove any two of it. (5)

13. The joint density function for two random variables, X and Y , is given by

$$f(x,y) = \begin{cases} a(x+y), & \text{for } x, y \in [0;\ 1]: \quad \text{where } a \text{ is a constant.} \\ 0, & Otherwise \end{cases}$$

A) Find the value of a (2)

B) Find the marginal distribution of X, (3)

C) Find E [X] (2)

14. A) A fire insurance company wants to relate the amount of fire damage (y, in lakh) in major residential fires to the distance between the residence and the nearest fire station (x, in km). The study is to be conducted in a large suburb of a major city, a sample of 5 recent fires in this suburb is selected which is given below

OBS	1	2	3	4	5
X	3.4	1.8	4.6	2.3	3.1
Y	26	18	31	23	28

i) Fit a simple linear regression model for predicting fire damage

ii) Predict fire damage at x = 5 km (4)

B) Explain the procedure of getting mode using graph (3)

PART – C

III Answer any TWO of the following: 2 x 10 = 20

15. A) State and prove the additive property of mathematical expectation (4)

B) Prove that standard deviation is independent change of origin but not scale (4)

C) What do you mean by partition values? Give two examples (2)

16. A) Probability of solving a specific problem by Arun & Tarun are $\frac{1}{2}$ & $\frac{1}{3}$ respectively. If both try to solve the problem independently, find the probability that

i) The problem is solved

ii) Exactly one of them solves the problem (3)

B) Distinguish between primary data and secondary data (2)

C) Define dispersion. Distinguish between absolute measures of dispersion and relative measures of dispersion (5)

17. A) If X & Y are two random variables with respective expectation E[X] and E[Y], then derive the expression for V(aX-bY) (3)

B) The probability mass function of a random variable X is $P(X=x) = \frac{1}{8}\ {}^{3}C_{x}$; x= 0,1,2,3

Find the distribution function and plot the same. (4)

C) Prove that moment generating function of n independent random variables is equal to product of their Moment generating function (3)