



Register Number:

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

**B.Sc. STATISTICS – I SEMESTER**

**SEMESTER EXAMINATION – JANUARY 2021**

**ST 118 – INTRODUCTION TO STATISTICS AND PROBABILITY**

**Time: 2½ hrs**

**Max: 70 Marks**

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

Note: Scientific calculators are allowed and graph sheets will be provided on request

**SECTION – A**

**I Answer any FIVE of the following:**

**5 x 3 = 15**

1. Define statistics and mention scope of statistics
2. Define the following terms  
A) Parameter            B) Sample                            C) Statistic
3. Define central tendency and mention any two measures of it.
4. What do you mean by positive correlation? Give an example for it
5. Explain conditional probability
6. Define a random variable and explain the different types of random variables with examples.
7. For the following distribution, find the value of 'K'?

$$P(X = x) = \begin{cases} K \binom{2}{x}, & x = 0, 1, 2. \\ 0, & \text{otherwise} \end{cases}$$

**SECTION – B**

**II Answer any FIVE of the following:**

**5 x 7 = 35**

8. A) Define dispersion and mention the requisites of a good measure of dispersion.  
B) Define skewness and mention three coefficients of skewness. (3+4)
9. A) The mean and standard deviation of a set of 10 values are 40 and 3 respectively. The mean and standard deviation of another set of 5 values are 46 and 2 respectively. Find the standard deviation of the combined set. (3)  
B) State and prove any two properties of arithmetic mean (4)
10. A) Given  $P(A)=0.3$ ,  $P(A \cup B)=0.6$ ,  $P(B) = p$ . Find the value of  $p$  if (i)  $A$  &  $B$  are mutually exclusive (ii)  $A$  &  $B$  are independent. (4)  
B) What are partition values? How are they determined graphically? (3)
11. A) Describe the principle of least squares in curve fitting. Obtain the normal equations-for fitting curve of the type  $y=a + bx$  (5)  
B) Write down the expression for spearman's Rank correlation co-efficient with usual notations (2)

12. A) What is regression? Explain any two differences between correlation and regression.

B) In a factory machine A and B produce springs of the same type. Of this production, machines A and B produce 8% and 6% defectives springs respectively. Machines A and B produce 70% and 30 % of total output of the factory. One spring is selected at random and found to be defective. What is the probability that the defective spring was produced by machine B? (3+4)

13. A) Prove the following: (i)  $E(aX+b) = a E(X)+b$  (5)  
(ii)  $V(aX+b) = a^2 V(X)$

And deduce the results when  $a = -2$  and  $b = 1$

B) What do you mean by coefficient of determination? (2)

14. A) Define distribution function and mention its properties. (2)

B) If pdf of X is  $f(x) = \begin{cases} 2x, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$ , then find the pdf of  $Y = X^3$  (5)

### SECTION – C

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

15. A) Write a note on different types of data. (4)

B) Explain the construction of box-plot or stem-leaf diagram for a raw data (3)

C) Define covariance between two random variables. (3)

16. A) A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is  $1/3$  and the wife's selection is  $1/5$ . What is the probability that (4)

i) Both of them will be selected.

ii) At least one of them will be selected

iii) Only one of them will be selected

B) Let X and Y be jointly continuous random variables with joint PDF (6)

$$f(x,y) = \begin{cases} Cx + 1, & x, y \geq 0, x + y = 1 \\ 0, & \text{otherwise} \end{cases}$$

i) Show the range of (X, Y), in the x-y plane

ii) Find constant C

iii) Find marginal PDF of X

17. A) Show that standard deviation is independent of change of origin. (5)

B) Define moment generating function. Prove that  $M_{Cx}(t) = M_X(Ct)$ , C being constant (5)