

Registration Number:

Date & session:



ST JOSEPH'S UNIVERSITY, BENGALURU - 27
B.Sc. (STATISTICS) – 2nd SEMESTER
SEMESTER EXAMINATION: APRIL 2024
(Examination conducted in May / June 2024)
ST221: Probability and Distributions

(For current batch students only)

Time: 2 Hours

Max Marks: 60

This paper contains TWO printed pages and THREE parts

PART- A

I Answer any FIVE from the following:

3 x 5 = 15

1. Define any three types of events with examples of each.
2. State and prove addition theorem of probability.
3. Explain discrete and continuous random variables with appropriate examples.
4. Define the expectation of a random variable for continuous random variables. Prove that $E(a^2+bX)=a^2+bE(X)$ for both discrete and continuous cases.
5. Define geometric distribution with appropriate notations. Mention any two properties of the same.
6. State any three properties of normal distribution.
7. Explain any three data types that the vectors can take with example.

PART- B

II Answer any FIVE from the following:

5 x 5 = 25

8. State and prove Bayes' Theorem. Provide any two applications demonstrating the Bayes' Theorem in real-world scenarios.
9. Discuss the concept of moment generating functions. State and prove any two of its properties.
10. Explain the memoryless property of exponential distribution. Provide a mathematical justification for the same.
11. State and prove recurrence property of Binomial Distribution.
12. **a.** Explain how variables are created and values are assigned in R.
b. Create a vector X containing the values: a,b,c,d.
c. State any three basic plotting functions in R. (1+1+3)
13. Write the syntax to obtain density function, distribution function and random number generation for the Uniform distribution.
14. **a.** Write the output of the code `X=rep(1:3,each=2)` and `Y=rep(4:6,times=2)`
b. Write the command to obtain mean, median and variance for X and Y. (3+2)



PART- C

III Answer any TWO from the following:

10 x 2 = 20

15. **a.** Explain any three approaches of probability with limitations of each.
b. Discuss the concept of independence of events. Provide examples of independent and dependent events.
c. Define conditional probability. (6+2+2)
16. **a.** Define Poisson distribution. Obtain the mean and variance for the same.
b. Write down the pdf of Normal distribution with usual notations.
c. Obtain the moment generating function for Uniform distribution. (7+1+2)
17. **a.** Define probability density function and distribution function.
b. State and prove addition and multiplication theorems of mathematical expectations for discrete and continuous random variables. (2+8)
