

25U247S

(Pages: 2)

Name:

Reg.No:

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2026

(CBCSS - UG)

CC19USTA2C02 - PROBABILITY THEORY

(Statistics - Complementary Course)

(2019 to 2023 Admissions - Supplementary)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer **all** questions. Each question carries 2 marks.

1. Mention the a priori definition of probability.
2. Given $P(A) = 0.30$, $P(B) = 0.78$ and $P(A \cap B) = 0.16$.
Find (i) $P(A^c \cap B^c)$ (ii) $P(A^c \cup B^c)$ (iii) $P(A \cap B^c)$.
3. Define independent events.
4. Define a continuous random variable.
5. What are the axioms of probability density function?
6. State the properties of probability density function.
7. Write any two properties of mgf.
8. Mention any two properties of characteristic function.
9. Write a short note on kurtosis.
10. What is joint probability density function.
11. Define marginal probability mass function. Explain with an example.
12. What do you mean by independence of two r.v.s?

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer **all** questions. Each question carries 5 marks.

13. What is a sample space? What are events?
14. If $P(A)=0.3$, $P(B)= 0.2$, $P(AB)=0.1$ find the probability of:
(i) At least one of the events occur.
(ii) Exactly one of the events occur.
(iii) None of the event occur.

15. If the cumulative distribution function of X is $F(x)$, find the cumulative distribution function of $Y = X^3$.
16. Let X be a continuous random variable with pdf $f(x)$. Let $Y = X^2$. Find the pdf and the distribution function of Y ?
17. Let X be a random variable with pmf
- | | | | | |
|--------|---------------|---------------|----------------|---------------|
| x | 0 | 1 | 2 | 3 |
| $f(x)$ | $\frac{1}{3}$ | $\frac{1}{2}$ | $\frac{1}{24}$ | $\frac{1}{8}$ |
- Find the expected value of $Y = (X - 1)^2$.
18. If X is a random variable having the pdf, $f(x) = \frac{x+1}{2}, -1 \leq x \leq 1$. Find $E(X)$ and $V(X)$.
19. State and prove the multiplication theorem on expectation.

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any **one** question. The question carries 10 marks.

20. (i) State and prove Baye's theorem.
- (ii) The probability that a doctor will diagnose a particular disease correctly is 0.6. The probability that a patient will die by his treatment after correct diagnosis is 0.4 and the probability of death by wrong diagnosis is 0.7. A patient of the doctor who had the disease died. What is the probability that his disease was not correctly diagnosed?
21. Let X and Y are random variables with joint pdf,
- $$f(x, y) = kx^2y; 0 < x < y < 1$$
- $$= 0; \text{otherwise}$$
- Find (i) k (ii) Marginal distributions of x and y . (iii) Verify whether x and y are independent.

(1 × 10 = 10 Marks)
