QP CODE: 25023170

25023170

Reg No : .....

Name : .....

B.A/B.SC DEGREE (CBCS) IMPROVEMENT / REAPPEARANCE/ MERCY CHANCE EXAMINATIONS, APRIL 2025

Second Semester

Complementary Course - ST2CMT02 - STATISTICS - PROBABILITY THEORY

(Common for B A Sociology Model I, B.Sc Computer Applications Model III Triple Main, B.Sc Mathematics Model I, B.Sc Physics Model I)

2017 Admission Onwards

211A72BB

Time: 3 Hours

Max. Marks : 80

Part A

Answer any ten questions.

Each question carries 2 marks.

1. Define (a) random experiment (b) sample space.
2. Define a partition of the sample space.
3. State addition theorem on probability for two events and three events.
4. State multiplication theorem of probability for two events.
5. Define random variable. Give an example.
6. Find out the p.m.f of $Y = X^2$, where X is with p.m.f

x	-2	-1	0	1	2
f(x)	1/5	1/5	1/5	1/5	1/5

7. Examine whether the following is a joint probability mass function. $f(x, y) = \frac{x+y}{18}$, $x = 1, 2$; $y = 1, 2$ and 0 elsewhere.
8. Define joint probability density function of a pair of continuous random variables.
9. Define correlation.
10. The coefficient of correlation between two variables x and y is 0.28. Their covariance is 7.6. If the variance of x is 9, then obtain the standard deviation of y .
11. Define scatter diagram.
12. Find the regression coefficient b_{yx} if $2x + 4y - 5 = 0$ is the regression equation of y on x.

(10×2=20)

Part B

Answer any six questions.

Each question carries 5 marks.

13. State (1) axiomatic definition (2) classical definition and (3) frequency definition of probability.

14. Find the probability of drawing (1) an ace (2) a card of clubs (3) an ace or a card of clubs from a well shuffled deck of 52 cards.

15. If A, B, C are pairwise independent and A is independent of B∪C , then show that A, B, C are mutually independent.

16. Consider the random experiment of throwing an unbiased die and let X be the random variable denoting the number coming up. Obtain the pmf and distribution function of X. Sketch them graphically.

17. Given the pdf $f(x) = e^{-x}$; $x > 0$ and 0 elsewhere, find the pdf of (1) $Y = X^3$ (2) $Y = 3X + 4$.

18. Let the joint pdf be $f(x,y) = k\,x(1-y)$; $0 < x < 1$, $0 < y < 1$ and 0 elsewhere, is a joint pdf, then find k and $P\left(0 < x < \frac{1}{3},\ 0 < y < \frac{1}{3}\right)$.

19. Explain marginal distributions and conditional distributions.

20. 6 girls in a beauty contest are ranked by two judges in the following order. Use the rank correlation coefficient to examine whether the judges have similarity of tastes.

girl	A	B	C	D	E	F
judge 1	1	6	5	3	2	4
judge 2	3	5	4	6	1	2

21. Obtain the angle between two regression lines.

(6×5=30)

Part C

Answer any two questions.

Each question carries 15 marks.

22. 1) State and prove Baye's theorem.

    2) Three identical boxes contain two balls each. One has both red, one has one red and one black, and the third has two black balls. A person chooses a box at random and takes out a ball. If the ball is red find the probability that the other ball in the box is also red?

23. A continuous random variable X has the following density function

    $f(x) = ax$; $0 < x < 1$

    $= a$; $1 < x < 2$

= $-ax + 3a$; $2 < x < 3$

= 0 elsewhere

(1) Determine the constant a (2) Find the distribution function (3) Sketch the graphs of f(x) and F(x)

24 Let the joint pdf be $f(x,y) = k\,xy\,(1-y)$; $0 < x < 1$, $0 < y < 1$ and 0 elsewhere. Find the conditional pdf of y given x and x given y. Examine whether X and Y are independent.

25 (1) Explain the fitting of curve of the form $y = a\,x^b$

(2) Fit a curve of the form $y = a\,x^b$ to the following data

x	1	2	3	4	5	6
y	2.98	4.26	5.21	6.1	6.8	7.5

(2×15=30)