QP CODE: 22103178

Reg No : .....

Name : .....

B.A/B.SC DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE EXAMINATIONS, OCTOBER 2022

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

6CE75D55

Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. Distinguish between discrete sample space and continuous sample space.
2. Distinguish between mutually exclusive events and exhaustive events.
3. Two unbiased dice are thrown together. Find the probability that the sum of the numbers on the faces is not less than 10.
4. Examine the consistency of the statement: $P(A) = 0.48$ and $P(A \cap B) = 0.81$
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. Mention the properties of joint pdf of a pair of continuous random variables.
8. Define the independence of two random variables.
9. Define correlation.
10. Calculate Karl Pearson's correlation coefficient between x and y if $\sum x = 35$, $\sum x^2 = 203$, $\sum y = 28$, $\sum y^2 = 140$, $\sum xy = 168$ and $n = 10$.
11. Define Spearman's correlation coefficient.

12. Define regression.

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Mention any two advantages and any two limitations of frequency definition of probability.

14. For any three events A, B and C, $P(A \cup B \mid C) = P(A \mid C) + P(B \mid C) - P(A \cap B \mid C)$.

15. The probabilities that a husband and wife will be alive 20 years from now is given by 0.8 and 0.9 respectively. Find the probabilities that in 20 years (1) both of them will be alive (2) neither of them will be alive (3) at least one will be alive.

16. Consider the random variable X with pdf $f(x) = 2x$; $0 < x < 1$ and zero elsewhere. Find (1) F (x) (2) $P(X \leq \frac{1}{2})$ (3) $P(\frac{1}{4} < X < \frac{3}{4})$

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. Two unbiased coins are tossed . Let X = 1 if the first coin shows head and X = 0 if it shows tail and let Y denotes the number of heads obtained. Obtain the joint probability mass function of (X, Y) .

19. Let the joint pdf be $f(x,y) = 6x^2 y$; $0 < x < 1$, $0 < y < 1$ and 0 elsewhere. Find $P(0 < x < \frac{3}{4} \mid \frac{1}{3} < y < 1)$

20. Explain the fitting of the curve $y = a b^x$.

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) The chances of X, Y, Z becoming the manager of a company are in the ratio 4 : 2 : 3. The probability that bonus scheme will be introduced if X, Y, Z become the managers are 0.3, 0.5, 0.8 respectively. The bonus scheme was introduced. What is the probability that X is appointed as the manager?

23. Given the probability mass function as follows :

$f(x) = k$; if $x = 0$,

$= 2k$; if $x = 1$,

$= 3k$; if $x = 2$

$= 0$; elsewhere

(1) Find the value of k (2) Determine the distribution function and sketch it graphically (3) Find the probabilities $P[X \geq 2]$, $P[X \leq 1]$ and $P[0 < X < 2]$ (4) What is the smallest value of m such that $P[X \leq m] > 0.5$.

24. Let the joint pdf be $f(x,y) = k(xy + 2x + 3y + 6)$; $0 < x < 1$, $0 < y < 1$ and 0 elsewhere. Find k. Examine whether X and Y are independent .

25. The following figures represent the relationship between heights of fathers (X) and heights of sons (Y) (in inches)

X	65	66	67	67	68	69	71
Y	67	68	64	68	72	70	69

(a) Obtain the two regression lines (b) Predict the height of the son if the height of the father is 65 inches

(2×15=30)