QP CODE: 21103218

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Reg No : ....

Name : ....

B A/B.SC DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, DECEMBER 2021

Second Semester

Complementary Course - ST2CMT02 - STATISTICS - PROBABILITY THEORY

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

2017 ADMISSION ONWARDS

4B80857D

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. Let sample space S = {1,2,3,4,5,6}. Let A = { ϕ, S, {1,2}, {3,4,5,6} }, B = { ϕ, S, {3,4,5,6}, {1,2,3} }. Examine whether A and B are sigma fields of events.
3. Define equally likely events and give an example.
4. Mention any two advantages of classical definition of probability.
5. Define random variable. Give an example.
6. Find out the p.m.f of Y=2X+3, where X is with p.m.f

x	1	2	3	4
f(x)	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{4}$

7. Define joint probability mass function of a pair of discrete random variables.
8. Define the independence of two random variables.
9. How is correlation coefficient related with regression coefficients?
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 rank correlation coefficient.
12. What do you mean by normal equations in curve fitting?

(10×2=20)

Part B

Answer any ***six*** *questions.*

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

13. There is a group of 40 people of whom 20 are engineers under 30 years of age and 10 are engineers over 30. Of the remaining 10 non engineers, 4 are under 30. If a person is selected at random from the group, what is the probability that the person is an engineer or a person over 30.

14. State and prove addition theorem on probability for two events.

15. Each of the three guns has a probability 0.4 for hitting a target. What is the probability that (1) all will hit the target (2) at least one will hit the target.

16. Consider the random experiment of tossing two unbiased coins together and let X be the random variable denoting the number of heads obtained. Obtain the pmf and distribution function of X. Sketch them graphically.

17. Given the pdf f(x) = $e^{-\mathbf{x}}$; 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. Given f (x | y) = $\frac{c_1\, x}{y^2}$; 0 < x < y < 1 and marginal pdf of y, f (y) = $c_2\, y^4$, obtain c_1 and c_2 and also get the joint pdf .

20. Explain the fitting of straight line of the form y = ax + b.

21. The regression lines are y = ax + b and x = cy +d and the two variables x and y have the same mean. Show that d (1 - a) = b (1 - c) .

(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. Examine whether the following is a pdf.
    f(x) = $\frac{x}{2}$; 0 < x < 1

$= \frac{1}{2}$; 1 < x < 2

$= \frac{1}{2}(3-x)$; 2 < x < 3

= 0 elsewhere

If yes, obtain its distribution function and P(|X| < 1.5)

24. Given $f(x,y) = c\,(xy^2 + e^x)$; 0 < x < 1, 0 < y < 1 and 0 elsewhere as a joint pdf,
(1) find c (2) find $P(\frac{1}{2} < X < \frac{2}{3})$ (3) find $P(\frac{1}{2} < X < \frac{2}{3}, \frac{1}{4} < Y < \frac{1}{2})$.

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)