## LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **STATISTICS**

FIRST SEMESTER – **NOVEMBER 2019**

**16/17/18UST1MC02 / ST 1501 / ST 1503 – PROBABILITY AND RANDOM VARIABLES**

Date: 01-11-2019          Dept. No.                    Max. : 100 Marks
Time: 09:00-12:00

**Section A**

**Answer ALL the questions**                                            (10X2=20)

1. Define random experiment.

2. Define equally likely events.

3. Write the classical definition of probability.

4. Two unbiased dice are thrown. Find the probability that both the dice show the same number.

5. Define conditional probability.

6. Define stochastic independence.

7. State the multiplication law of probability.

8. What is a Bernoulli trial?

9. Define continuous random variables.

10. Define Mathematical expectation for discrete random variables.

**Section B**

**Answer any FIVE of the following**                                    (5X8=40)

11. State and prove addition law of probability.

12. A committee of 4 people is to be appointed from 3 officers of the production dependent, 4 officers of the purchase dependent, 2 officers of the sales dependent and 1 Chartered accountant. Find the probability of forming the committee in the following manner (i). There must be one of each category (ii). The Chartered accountant must be in the committee.

13. For any three events A, B, and C. Prove that $P(A \cup B / C) = P(A / C) + P(B / C) - P(A \cap B / C) .\backslash$

14. State and prove Baye's theorem.

15. State all the properties of expectation.

16. The probability that a student passes a physics test is 2/3 and the probability that he passes both physics and an English test is 14/45. The probability he passes atleast one test 4/5. What is the probability that he passes the English test?

17. The odds that person X speaks the truth are 3:2 and the odds that person Y speaks are 5:3. In what percentage of cases are they likely to contradict each other on an identical point.

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18. The diameter of an electric cable, say X, is assumed to be a continuous random variable with p.d.f.

$f(x) = 6x(1-x)$ , $0 \le x \le 1$.

(i). Check that f(x) is p.d.f.

(ii). Determine a number 'b' such that $P(X < b) = P(X > b)$.

## Section C

**Answer any TWO of the following** **(2X20=40)**

19. a) Two dice are tossed. Find the probability of getting 'an even number on the first die or a total of 8'.

b) Twenty five books are placed at random variable in a shelf. Find the probability that a particular pair of book shall be (i). always together and (ii). Never together.

20. a) Form a city population, the probability of selection (i). a male or a smoker is 7/10    (ii). a male smoker is 2/5 (ii). a male, if a smoker is already selected is 2/3. Find the probability of selecting (a) a non-smoker (b) a male.

b) The contents of urun I, II and III are as follows

1 White, 2 Black and 3 Red balls

2 White, 1 Black and 1 Red balls and

4 White, 5 Black and 3 Red balls

One urn is chosen at random and two balls drawn from it. They happen to be white and red. What is the probability that they come from urns I, II or III?

21. a) State and prove Chebychev's inequality.

b) Let X be a random variable with the following probability distribution.

| x    : | -3  | 6   | 9   |
|--------|-----|-----|-----|
| P(x):  | 1/6 | ½   | 1/3 |

Find E(x) and E(x$^2$).

22. Suppose that two dimensional continuous random variable (X, Y) has joint p.d.f. given -by

$f(x, y) = 6x^2 y$ , $0 < x < 1, 0 < y < 1$.

(i). Verify that $\int_0^1 \int_0^1 f(x, y)dxdy = 1$.

(ii). Find

$P(0 < X < 3/4, 1/3 < Y < 2)$

$P(X + Y < 1)$

$P(X > 4)$

$P(X < 1/ Y < 2)$

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