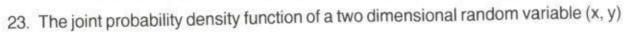
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is given by
$$f(x, y) = \begin{cases} 2 & 0 < x < 1, & 0 < y < x \\ 0 & \text{otherwise} \end{cases}$$

- i) Find the marginal density function of x and y.
- ii) Find the conditional density function of x gives y and conditional density function of y gives x.
- 24. What do you mean by marginal and conditional distributions. The following table represents the joint probability distribution of a discrete random variable (x, y)

- i) Evaluate marginal distribution of x.
- ii) Evaluate the conditional distribution of y give x = 2.

III-CHERTHIA



M 8879

II Semester B.Sc. Degree (CCSS – 2014 Admn. – Regular) Examination, May 2015

COMPLEMENTARY COURSE IN STATISTICS (For Maths/Comp. Sci./Electronics Core)

2C02 STA: Probability Theory and Random Variables

Time: 3 Hours

Max. Marks: 40

PART-A

Answer all the 6 questions.

Reg. No. :

Name :

 $(6 \times 1 = 6)$

- 1. Define random experiment. Give an example.
- 2. Define classical definition of probability.
- 3. Define probability space.
- 4. State multiplication theorem on probability.
- 5. Define random variable.
- 6. Define conditional distribution.

PART-B

Answer any 6 questions.

 $(6 \times 2 = 12)$

- 7. State the axioms of probability.
- 8. Define distribution function and state its properties.
- Two six-faced unbiased dice are thrown. Find the probability that the sum of the numbers shown is 7 or their product is 12.

P.T.O.



- 10. If $f_1(x)$ and $f_2(x)$ are p.d.f's and $\theta_1 + \theta_2 = 1$; $0 < \theta_1$, $\theta_2 < 1$ examine whether $g(x) = \theta_1 f_1(x) + \theta_2 f_2(x)$ is a p.d.f.
- 11. For the following density function $f(x) = C x^2 (1 x)$, 0 < x < 1. Find the value of C.
- 12. Given the probability function

x 0 1 2 3 P(x) 0.1 0.3 0.5 0.1

Find the probability function of $y = x^2 + 2x$.

- 13. From a lot of 10 items containing 3 defectives, a sample of 4 items is drawn at random. Find the probability distribution of the no. of defective items selected.
- 14. Two discrete random variables X and Y have

$$P(X = 0 \ Y = 0) = \frac{2}{9} \ P(X = 0 \ Y = 1) = \frac{1}{9}$$

$$P(X = 1 \ Y = 0) = \frac{1}{9} \ P(X = 1 \ Y = 1) = \frac{5}{9}$$

Examine whether X and Y are independent.

Answer any 4 questions.

 $(4 \times 3 = 12)$

- 15. State and prove Bayes theorem.
- 16. A problem in statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved if all of them try independently?

$$\begin{cases} ax & 0 \le x \le 1 \\ a & 1 \le x \le 2 \end{cases}$$
 17. Let X be a continuous random variable with p.d.f. $f(x)$
$$\begin{cases} ax & 0 \le x \le 1 \\ 0 & elsewhere \end{cases}$$

- Determine the constant a.
- ii) Compute P(X ≤ 1.5)

CHRIMIN

-3-

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- 18. Find K so that f(x, y) = k x y, $1 \le x \le y \le 2$ will be a probability function.
- 19. Let $f(x) = \begin{cases} \frac{1}{2} & -1 < x < 1 \\ 0 & \text{elsewhere} \end{cases}$ be the p.d.f. of a r.v.X. Find the p.d.f. of $y = x^2$.
- 20. The joint p.d.f. of a two dimensional random variable (X, Y) is given by

$$f(x, y) = \begin{cases} \frac{x^3y^3}{16} & 0 \le x \le 2, \ 0 \le y \le 2 \\ 0 & \text{elsewhere} \end{cases}$$

Find the marginal densities of X and Y. Also find the distribution function of X and Y.

Answer any 2 questions.

 $(2 \times 5 = 10)$

- The odds against student X solving a problem are 8 to 6 and odds in favour of student Y solving the problem are 14 to 16.
 - 1) What is the probability that the problem will be solved if they both try independently of each other?
 - 2) What is the probability that none of them is able to solve the problem.
- 22. A random variable X has the following probability distribution:

Value of X x 0 1 2 3 4 5 6 7 8

p(x) a 3a 5a 7a 9a 11a 13a 15a 17a

- 1) Determine the value of a
- 2) Find P(x < 3), $P(x \ge 3) P(0 < x < 5)$
- 3) What is the smallest value of x for which $P(X \le x) > 0.5$?
- 4) Find out the distribution function of X.