LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRSTSEMESTER – APRIL 2017

16UST1MC02 / ST 1503 - PROBABILITY AND RANDOM VARIABLES

Date: 18-04-2017 Dept. No. Max. : 100 Marks
09:00-12:00

Part – A

Answer **ALL the** questions **(10*2=20 Marks)**

1. Define mutually exclusive events with an example.
2. Find the probability of getting an even number from a box containing 1 to 100 numbers.
3. State addition theorem of probability.
4. Define random variables and give an example.
5. Define independent events.
6. Distinguish between discrete and continuous random variable
7. Define variance of the random variable X.
8. Define Bernoulli trials in probability theory.
9. If variance of the random variable X is Var(X) =9. Find Var(2X).
10. Give any two properties of mathematical Expectation.

Part – B

Answer any **FIVE** thequestions **(5*8=40 Marks)**

11. If A and B are independent events then prove that $\overline{A}$ and $\overline{B}$ are also independent events.
12. State and prove the multiplication theorem of probability for two mutually exclusive events.
13. Let **A**and**B** be two events. Show that $P(A\cap B)\le P(A)\le P(A\cup B)\le P(A)+P(B)$
14. State and prove addition theorem of expectations.
15. A random variable X has the following probability function:

Values of X, x:	0	1	2	3	4	5	6	7
P(x):	0	k	2k	2k	3k	k^2	$3k^2$	$7k^2$+k

(i) Find k, (ii) P(X<6), P(X≥ 6) and $P(0<X<5)$,(iii) If $P(X\le a)>\frac{1}{2}$) find the minimum value of a, (iv) Determine the distribution function of X. **(1+3+2+2)**

16. Let X be a random variable with pdf $f(x)=\frac{1}{20}e^{-20\,x}, x>0, zero\ else\ where$

find i) $P(X\le 10)$ ii) $P(16\le X\le 24)$

17. a)Find the expectation of the number on a die when thrown (b) Two unbiased dice are thrown. Find the expected values of the sum of numbers of points on them.

18. Prove that $E(XY) = E(X).E(Y)$ when X and Y are independent.

Section - C

Answer any **TWO**questions **(2*20=40 Marks)**

19. (a) State and prove Bayes theorem.

(b)Three urns of the some appearance have the following proportion of balls:

Urn I : 2 black, 1 white

Urn II: 1 black, 2 white

Urn III: 2 black, 2 white

An urn is selected and one ball is drawn. What is the probability that it is white?

20. a) The pdf of random variable X is given by $f(x) = kx(1-x), 0 \leq x \leq 1$ otherwise zero. Determine k. Find E(x) and Var(x).

(b) Define continuous distribution function and write their properties.

21. (a) State and prove Chebyshev's inequality

(b) Define the following statements: (i) Axioms of probability (ii) Mathematical expectation with suitable example (iii) sample space and events with suitable examples.

22. Explain the various terms which are used in the definition of probability under different approaches:

(a) Random experiment (b) outcome (c) Trail and event (d) Exhaustive event (e) Favourable event (f) Mutually exclusive event (g) Equally likely event (h) independent event

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