LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **APRIL 2024**

UST 1502 – PROBABILITY AND DISCRETE DISTRIBUTIONS

Date: 22-04-2024 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

	SECTION A - K1 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
1.	**Fill in the blanks**	
a)	Outcomes of trial are said to be _____ events if there is no reason to expect one in preference to the others.	
b)	If A and B are independent then P(A / B) = _____ .	
c)	A random variable is said to be _____ when its different values cannot be put in 1-1 correspondence with a set of positive integers.	
d)	If X and Y are independent then Cov (X,Y) = _____.	
e)	The discrete distribution which lacks memory is _____ .	
2.	**Match the following**	
a)	Result of a Random Experiment - Distribution Function	
b)	$P(A \cap B)$ - Poisson Distribution	
c)	Non-decreasing function of x - P(A) P(B/A)	
d)	E(XY) - Outcome	
e)	Number of printing mistakes - E(X) E(Y)	
	SECTION A - K2 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
3.	**True or False**	
a)	Mutually exclusive events are independent.	
b)	The conditional probability of A given B is always greater than P(A).	
c)	Probability cannot exceed unity.	
d)	Variance is independent of change of origin.	
e)	Mean of Binomial distribution is npq.	
4.	**Define the following**	
a)	Classical probability.	
b)	Conditional probability.	
c)	Marginal distribution of X for discrete random variable.	
d)	Moment Generating Function.	
e)	Hypergeometric distribution.	
	SECTION B - K3 (CO2)	
Answer any TWO of the following		**(2 x 10 = 20)**
5.	A letter of the English alphabet is chosen at random. Utilize classical approach to calculate the probability that the letter so chosen (i) is a vowel (ii) precedes m and is a vowel (iii) follows m and is a vowel.	
6.	State and Prove Bayes' theorem.	
7.	State and prove addition theorem of probability for two events and also obtain the result when A	

	and B are independent.
8.	Make use of Moment generating function to find the mean and variance of Negative Binomial distribution.
SECTION C – K4 (CO3)	
Answer any TWO of the following	**(2 x 10 = 20)**
9.	Three groups of children contain respectively 3 girls and 1 boy, 2 girls and 2 boys, and 1 girl and 3 boys. One child is selected at random from each group. What is the probability that the three selected consist of 1 girl and 2 boys?
10.	State and prove Chebyshev's inequality.
11.	In four tosses of a coin, let X be the number of heads. Tabulate the 16 possible outcomes with the corresponding values of X. Derive the probability distribution of X and hence calculate the expected value of X.
12.	Derive the M.G.F of geometric distribution and hence find the mean and variance.
SECTION D – K5 (CO4)	
Answer any ONE of the following	**(1 x 20 = 20)**
13.	Derive the mean and variance of Poisson distribution.
14.	a) The contents of urns I, II, III are as follows: 1 white, 2 black, 3 red balls, 2 white, 1 black, 1 red balls and 4 white, 5 black, 3 red balls One urn is chosen at random and two balls drawn from it. They happen to be white and red. Determine the probability that they come from urns I, II or III? b) Examine the effect of change of origin and scale on m.g.f.
SECTION E – K6 (CO5)	
Answer any ONE of the following	**(1 x 20 = 20)**
15.	Derive the moment generating function of binomial distribution.
16.	a) State and prove addition theorem of expectation. b) Develop recurrence relation for moments of Poisson distribution. (10 + 10)

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