LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

U.G. DEGREE EXAMINATION – **ALLIED**

SECOND SEMESTER – APRIL 2023

UST 2302 – MATHEMATICAL STATISTICS

Date: 10-05-2023

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

Answer ALL the Questions(101Definitionsa)Probability mass function.b)The uniqueness theorem of moment generating function.c)Binomial distribution.d)t-distribution.e)Sample variance.2.Fill in the blanksa)Conditional probability function P(A/B) isb)Mean and variance of negative binomial distribution arec)The moment generating function of the Poisson distribution isd)Mean and variance of Chi-Square distribution isc)The sample Mean isc)The sample Mean isd)Maxer ALL the Questions10)3.3.Match the followinga)If X and Y are independent if and only if Cov(X,Y) $\frac{1}{\theta}$ and $\frac{1}{\theta^2}$ b)Hypergeometric Distribution Continuousc)Mean and Variance of exponential distribution are 0d)Gamma Distribution Discretee)Uniform Distribution Discretee)Uniform Distribution f(x) = $\frac{1}{b-a}$; $a \le x \le b$ 4.True or Falsea)In probability, a real-valued function, defined over the sample space of a random exp called a random variable.b)The mean of negative normal distribution is $n-1$.c)Geometric distribution mean and variance are same.d)The degrees of freedom for Chi-square distribution is $n-1$.e)F test is used to test for equality of variances from two normal populations												
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Answer any TWO of the following (2 x 10 = 20)												
5. A random variable X has the following probability distribution:												
r 0 1 2 3 4 5 6 7 8												

	p(x)	k	3k	5k	7k	9k	11k	13k	15k	17k			
	(i)	Ľ)eterm	ine th	e valu	ie of k	ζ.	I	1	<u> </u>	J		
	(ii) Find $p(X < 3)$ and $p(0 < X < 5)$												
6.	Obtain the mean and variance of Geometric distribution.												
7.	Derive the mean and variance of Beta distribution of second kind.												
8.	Derive the mean and variance of the chi-square distribution.												
	SECTION C – K4 (CO3)												
	Answer any TWO of the following(2 x 10 = 20)												
9.	State and prove Chebyshev's inequality.												
10.	 A manufacturer of pins knows that, 2% of the products are defective. If he sells pins in boxes of 100 and guarantees that not more than 4 pins will be defective. (i) What is the probability that a box will fail to that guaranteed quantity? (ii) Compute P(x=0) and P(x≤2) 												
11.	Show that the geometric distribution lacks memory.												
12.	 a) Explain F distribution and give the F-test statistic. (4) b) The mean weekly sales of soap bars in departmental stores was 146.3 bars per store. After an advertising campaign the mean weekly sales in 22 stores for a typical week increased to 153.7 and showed a standard deviation of 17.2. Was the advertising campaign successful? (6) 												
$\frac{\text{SECTION D} - \text{NS}(\text{CO4})}{\text{Answer any ONE of the following}} \qquad (1 \times 20 - 20)$													
13.	Two ra	ndom	varia	bles X	K and	Y hav	e the fo	ollowin	g ioint	probabi	ility density function.		
					1	f(r v	$= \{2\}$	-x-z	y, C	$0 \le x, y$	v < 1		
	Informati		-14 A		J	(<i>x</i> , <i>y</i>	/ - (C),	Ot	herwis	swe		
	 (i) The marginal probability density function of X and Y (ii) Conditional density function of X and Y (iii) Variance of X and Y (iv) Covariance between X and Y 												
14.	State a	nd pro	ove the	e Lind	leberg	g -Lev	y theor	em					
						SF	ECTIO	N E – 1	K6 (CC	95)			
	Answe	r any	ONE	c of th	e foll	owing	5				(1 x 20	= 20)	
15.	a). (i) I	Define	e Corr	elation	n and	classi	fy the r	ange of	f Karl P	earson'	's Correlation Coefficient.	(4)	
	(ii) F	Find r	XY for	the fo	ollowi	ing pro	oblem					(0)	
	X	65	66	5 (57	67	68	69	70	72		(8)	
	Y	67	68	; (65	68	72	72	69	71			
		1											
16	b) Define normal distribution and state the properties of normal distribution. (8)											(8)	
10.	b) Derive the joint probability density function of a single order statistics.										(10) (10)		
	10) Derive are joint probability density function of second order statistics. (10)										(10)		
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