



ADAMAS UNIVERSITY
END SEMESTER EXAMINATION
 (Academic Session: 2020 – 21)

Name of the Program:	B.Sc. (Hons.) Computer Science	Semester:	II
Paper Title:	Probability and Statistics	Paper Code:	SDS11502
Maximum Marks:	50	Time Duration:	3 Hrs
Total No. of Questions:	17	Total No of Pages:	03

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

Group A
Answer All the Questions (5 x 1 = 5)

1	Define probability of an event.	R	CO2
2	Define the random variable for the hyper-geometric distribution.	R	CO2
3	A random variable X follows uniform distribution with mean 1 and variance $\frac{4}{3}$. Find its parameter values.	R	CO2
4	What do you mean by sampling distribution?	U	CO3
5	Define a statistical hypothesis.	R	CO3

Group B
Answer All the Questions (5 x 2 = 10)

6 a)	Define central, non-central and raw moments.	R	CO1
(OR)			
6 b)	What do you mean by scatter diagram? Explain with example.	R	CO1
7 a)	Give at least four examples of a random variable which follow a Poisson distribution.	U	CO2
(OR)			
7 b)	Give two examples of each geometric and exponential distribution.	U	CO2
8 a)	Find the maximum likelihood estimator of parameter of an exponential distribution based on the random sample X_1, X_2, \dots, X_n of size n .	R	CO3
(OR)			
8 b)	Find the maximum likelihood estimator of parameter of a Poisson distribution based on the random sample X_1, X_2, \dots, X_n of size n .	R	CO3
9 a)	What are the various properties of correlation coefficients?	R	CO4
(OR)			
9 b)	Show that the two independent random variables are uncorrelated but converse of this is not necessarily true.	U	CO4
10 a)	Show that the product of regression coefficient of Y on X and the regression coefficient of X on Y is equal to $r^2(X, Y)$. Here $r(X, Y)$ denotes the correlation coefficient between X and Y.	U	CO4
(OR)			
10 b)	If one of the regression coefficients is greater than unity, then the other must be less than unity.	U	CO4

Group C

Answer All the Questions (7 x 5 = 35)																										
11 a)	Discuss various terminologies in defining a random experiment.						R	CO2																		
(OR)																										
11 b)	Check that the given joint function of random variable X and Y is pdf. If yes, find marginal density of (i) X given Y, and (ii) Y given X. $f(x,y) = \begin{cases} x+y & 0 \leq (x,y) \leq 1 \\ 0 & , \text{ otherwise} \end{cases}$						U	CO2																		
12 a)	Show that: i) Probability of an impossible event is zero. ii) The probability of a complementary \bar{A} of A is given as $P(\bar{A}) = 1 - P(A)$. iii) If $B \subset A$, then (a) $P(A \cap \bar{B}) = P(A) - P(B)$ (b) $P(B) \leq P(A)$.						U	CO2																		
(OR)																										
12 b)	Let random variable X have the following distribution form: <table border="1"><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>P(X=x)</td><td>0</td><td>k</td><td>2k</td><td>2k</td><td>3k</td><td>k^2</td><td>$2k^2$</td><td>$7k^2 + k$</td></tr></table> Find the (i) value of k (ii) $P(X < 6)$ (iii) $P(X > 6)$ (iv) $P(0 \leq X \leq 5)$ (v) $P(0 < X < 5)$.						X	0	1	2	3	4	5	6	7	P(X=x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$	U	CO2
X	0	1	2	3	4	5	6	7																		
P(X=x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$																		
13 a)	Define conditional probability of event. The odds that person X speaks the truth are 3:2 and the odds that person Y speak the truth are 5:3. In what percentage of cases are the likely to contradict each other on an identical point?						U	CO2																		
(ORU)																										
13 b)	Define Bayes' theorem. Box I contain 1 white, 2 black and 3 red balls; box II contain 2 white, 1 ball and 1 red balls; box III contain 4 white, 5 black and 3 red balls. One box is selected at random and 2 balls are drawn. It is found that one ball is red one is white. What is the probability that they came from box I, box II and box III.						U	CO2																		
14 a)	Define χ^2 -distribution. We collect a random sample of ten bags. Each bag has 100 pieces of candy and five flavours. Test for the goodness of fit for the distribution of candy in the bags. Take $\chi^2_{(4)} = 9.488$ at given level of significance $\alpha = 0.05$. <table border="1"><tr><td>Flavour</td><td>Apple</td><td>Lime</td><td>Cherry</td><td>Orange</td><td>Grape</td></tr><tr><td>Fred.</td><td>180</td><td>250</td><td>120</td><td>225</td><td>225</td></tr></table>						Flavour	Apple	Lime	Cherry	Orange	Grape	Fred.	180	250	120	225	225	U	CO3						
Flavour	Apple	Lime	Cherry	Orange	Grape																					
Fred.	180	250	120	225	225																					
(OR)																										
14 b)	i) Define F-distribution. ii) Define standard error, tolerance interval, prediction interval. (2+3)						R	CO3																		
15 a)	Define t-distribution. Find the t-test value for the following two sets of values: 7, 2, 9, 8 and 1, 2, 3, 4?						U	CO3																		
(OR)																										
15 b)	Discuss the testing of one sample mean for both standard deviation known and unknown. A Little League baseball coach wants to know if his team is representative of other teams in scoring runs. Nationally, the average number of runs scored by a Little League team in a game is 5.7. He chooses five games at random in which his team scored 5, 9, 4, 11, and 8 runs. Is it likely that his team's scores could have come from the national distribution? Assume an alpha level of 0.05.						U	CO3																		
16 a)	Discuss the procedure of obtaining the maximum likelihood estimator of θ in the case of one-parametric distribution function $f(x, \theta)$.							CO3																		
(OR)																										
16 b)	Sample of two types of electric bulbs were tested for length of life and following data were obtained:						AP	CO3																		

		Type A	Type B		
	Sample no.	$n_1 = 8$	$n_2 = 7$		
	Sample means	$\bar{x}_1 = 1234\text{hrs}$	$\bar{x}_2 = 1036\text{hrs}$		
	Sample SD	$s_1 = 36\text{hrs}$	$s_2 = 40\text{hrs}$		
	Is the difference in the means sufficient to warrant that Type A is superior to Type B regarding length of life?				
17 a)	Obtained the correlation coefficient between observed and estimated values of random variables.			U	CO4
(OR)					
17 b)	Discuss the method of least square estimate for the fitting of $Y = aX^b$.			U	CO4