National University of Computer & Emerging Sciences, Karachi
Fall-2023 FAST School of Computing
Mid Term 2
2nd November, 2022, (11:00 am – 12:00 noon)

Course Code: MT - 2005	Course Name: Probability & Statistics
Instructor Name :Mr. Muhammad Amjad	
Student Roll No:	Section No: BCS – 5A

Instructions:

- Return the question paper.
- Read each question completely before answering it. There are 4 **questions and 2 pages.**
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.
- All the answers must be solved according to the sequence given in the question paper.

Time: 60 minutes. Max Marks: 40 points

Proposed time: 15 minutes CLO2 [Marks:10]

Question # 1 (a) A shipment of 7 Computer sets contains 2 defective sets. A hotel makes a random purchase of 3 of the sets. If x is the number of defective Computer sets purchased by the hotel,

i. Find the PMF, and the probability distribution of "X". [3]

ii. Express the results graphically as a probability histogram. [1]

iii. Find the cumulative distribution function of the random variable X representing the number of defectives. Then using F (x), Also, find P (X = 1) & P (0 <X≤ 2). [3]

Question # 01 (b) Find *'k'* such that following are probability distributions. And calculate mean and Variance.

$$P(X = x) = k\,x\,, \quad for \quad x = 0.25\,, 0.50\,, 0.75$$ [3]

Proposed time: 15 minutes CLO2 [Marks:10]

Question # 02

a) A major bank issues credit cards under the name VISACARD. It has determined that, on average, 40 percent of all credit card accounts are paid in full following the initial billing. That is, for any given month, 40 percent of all account will not incur interest charge. If a sample of six account is selected at random, estimate the probability that none of the six will have incurred interest charges for their last billing. [3]

b) A typist makes 3 errors per page on the average. What is the probability that he makes 5 errors on the next page he types? [3]

c) The probabilities are 0.4, 0.2, 0.3, and 0.1, respectively, that a delegate to a certain convention arrived by air, bus, automobile, or train. What is the probability that among 9 delegates randomly selected at this convention, 3 arrived by air, 3 arrived by bus, 1 arrived by automobile, and 2 arrived by train? [2]

d) If the probability is 0.85 that an applicant for a driver's license will pass the test on a given, try. What is probability that an applicant will finally pass the text on the 3rd try? [2]

Proposed time: 15 minutes CLO2 [Marks:10]

Question # 03

Given the following joint *p. d. f*: :

$$f(x,y) = \begin{cases} (2 - x - y) & 0 \le x \le 1 \ ; \quad 0 \le y \le 1 \\ 0 & else\ where \end{cases}$$

(a) Verify that $f(x,y)$ is a joint density function. [2]

(b) Calculate (i) $P(X \le \frac{3}{2}, Y \le \frac{1}{2})$, [2]

(c) Find the marginal p. *d. f* of *g(x)* and *h(y).* [3]

(d) Find the Covariance of X and Y. [3]

Proposed time: 15 minutes CLO2 [Marks: 10]

Question # 04

A program consists of two modules. The number of errors, X in the first module and the number of errors Y, in the second module have the following joint probability distribution in the table. Find

$f(x,y)$		x		
		0	1	2
y	0	0	2/70	3/70
	1	3/70	18/70	9/70
	2	9/70	18/70	3/70
	3	3/70	2/70	0

(i)The marginal distribution of $\boldsymbol{X\ and\ Y}$. [2]

(ii) The probability of no errors in the first module [1]

(iii) The distribution of errors in the program $\boldsymbol{P}\ [\ \boldsymbol{x} + \boldsymbol{Y} \le \boldsymbol{2}]$. [3]

(iv)$\boldsymbol{P}(\ \boldsymbol{x} = \boldsymbol{0} / \boldsymbol{y} = \boldsymbol{2})$, [3]

(v) Also, find out if errors in the two modules X and Y occurs independently? [1]