National University of Computer and Emerging Sciences, Lahore Campus				
	Course:	**Probability and Statistics**	**Course Code:**	**MT2005**
	Program:	**BS(Data Science)**	**Semester:**	**Fall-2023**
	Instructor:	**Ms. Kanwal Saleem**	**Total Marks:**	**90**
	Submission Date:	**30-10-2023**	**Weight**	**3%**
	Section:	**All**	**Page(s):**	**3**
	Evaluation	**Assignment-2 (Graded)**	**Roll No:**	
Instruction/Notes:	**Attempt All Questions**			

Instructions ***Follow the instructions carefully otherwise you will lose few marks.***

- Use A4 size blank pages and blue/black pen for solving the assignment.
- Assignments submitted after the DUE DATE will not be accepted.

QUESTION 1: **(Marks=15)**

A continuous random variable X that can assume values between x = 2 and x = 5 has a density function given by

$$f(x) = \frac{2(1+x)}{27}.$$

By using the above pdf find:

(a) P(X<4) **(2)**

(b) P(3≤X<4) **(2)**

(c) Find cumulative distribution function and use it to evaluate P(3≤X<4). **(4)**

(d) Obtain expectation and variance of X. **(7)**

QUESTION 2: **(Marks=7)**

The experience of a house-agent indicates that he can provide suitable accommodation for 75 percent of the clients who come to him. If on a particular occasion, 6 clients approach him independently, calculate the probability that the clients will get satisfactory accommodation if the following cases are observed.

(a) Less than 4 clients **(2)**

(b) Exactly 4 clients **(2)**

(c) At least 5 clients **(3)**

QUESTION 3: **(Marks=30)**

Three cards are drawn without replacement from the 12 face cards (jacks, queens, and kings) of an ordinary deck of 52 playing cards. Let X be the number of kings selected and Y be the number of jacks selected. Find:

(a) The joint probability distribution of X and Y **(12)**

(b) The Marginal probability distribution of X and Y **(2)**

(c) Find Conditional Distribution of X given Y=1 and Y=3 **(3)**

(d) Verify E(X+Y)=E(X)+E(Y) **(4)**

(e) Find Correlation Coefficient between X and Y **(7)**

(f) Are X and Y Independent? **(2)**

QUESTION 4: **(Marks=8)**

A certain area of the eastern United States is, on average, hit by 6 hurricanes a year. Find the probability that in a given year that area will be hit by

(a) Fewer than 4 hurricanes **(5)**
(b) Anywhere from 6 to 8 hurricanes. **(3)**

QUESTION 5: **(Marks=10)**

Find the Probability distribution of the sum of dots less than 7 when two fair dice are thrown. Also find mathematical expectation and variance of sum of dots less than 7.

QUESTION 6: **(Marks=8)**

If a publisher of nontechnical books takes great pains to ensure that its books are free of typographical errors, so that the probability of any given page containing at least one such error is 0.005 and errors are independent from page to page, what is the probability that one of its 600-page novels will contain

(a) Exactly one page with errors **(3)**
(b) At Most 3 pages with errors **(5)**

QUESTION 7: **(Marks=6)**

(a) Determine the probability that the Income Tax Authorities will catch 3 income tax returns with illegitimate deductions, if it randomly selects 6 returns from 20 income tax returns of which 8 contain illegitimate deductions. **(3)**

(b) Find the probability that the Income Tax Authorities will catch at least 3 income tax returns with illegitimate deductions. **(3)**

QUESTION 8: **(Marks=6)**

A and B play a game in which A's probability of winning is 2/3. In a series of 8 games, what is the probability that A will win

(a) exactly four games **(2)**

(b) from 3 to 6 games **(4)**