National University of Computer and Emerging Sciences, Lahore Campus				
	Course:	Probability & Stats	Course Code:	MT2005
	Program:	BS CS-SE	Semester:	Spring 2022
	Duration:	1 hour	Total Marks:	30
	Paper Date:	May 07; 2022	Weight	15%
	Section:	All	Page(s):	01
	Exam:	Sessional - II	Time:	9:00 - 10:00
Instruction/Notes:	Attempt All Questions. Show complete working (steps) in the solutions.			

Q1. **(a)** A student's score on a 10-point quiz is equally likely to be any integer between 0 and 10. What is the probability of an A, which requires the student to get a score of 9 or more? What is the probability the student gets an F by getting less than 4? **Points (2.5)**

(b) There is a 1% probability for a hard drive to crash. Therefore, it has two backups, each having a 2% probability to crash, and all three components are independent of each other. The stored information is lost only in an unfortunate situation when all three devices crash. What is the probability that the information is saved? **Points (2.5)**

(c) There are 20 computers in a store. Among them, 15 are brand new and 5 are refurbished. Six computers are purchased for a student lab. From the first look, they are indistinguishable, so the six computers are selected at random. Compute the probability that among the chosen computers, two are refurbished. **Points (05)**

(d) A problem on a multiple-choice quiz is answered correctly with probability 0.9 if a student is prepared. An unprepared student guesses between 4 possible answers, so the probability of choosing the right answer is 1/4. Seventy-five percent of students prepare for the quiz. If Mr. X gives a correct answer to this problem, what is the chance that he did not prepare for the quiz? **Points (05)**

Q2. **(a)** An internet router can send packets via route 1 or route 2. The packet delays on each route are independent exp(λ) random variables, and the difference in delay between route 1 and route 2 is denoted by X, has the following Laplacian density function. **Points (05)**

$$f_X(x) = \frac{\lambda}{2} e^{-\lambda|x|}, \qquad -\infty < x < \infty$$

Find $P(-3 \le X \le -2 \text{ or } 0 \le X \le 3)$.

(b) The waiting time, in hours, between successive speeders spotted by a radar unit is a continuous random variable with cumulative distribution function **Points (05)**

$$F(x) = \begin{cases} 0, & x < 0 \\ 1 - e^{-8x}, & x \ge 0 \end{cases}$$

i. Find the probability density function of X.
ii. Find P (x < 0.2) by using the probability density function.
iii. Find P (x < 0.2) by using the cumulative distribution function.

(c) A dangerous computer virus attacks a folder consisting of 50 files. Files are affected by the virus independently of one another. Each file is affected with the probability 0.2. What is the probability that more than 5 files are affected by this virus? **Points (05)**