আন্তর্জাতিক ইসলামী বিশ্ববিদ্যালয় চট্টগ্রাম
International Islamic University Chittagong
Department of Civil Engineering, FSE

Mid Term

SEMESTER- Autumn- 2022 SESSION
MATH 2305-Probability & Statistics, Laplace Transform

Programme	**: Bachelor of Civil Engineering**	**Level of Study**	**: UG 2**
Time	**: 9.15~10.45am**	**Date**	**: 24th September 2022 Saturday**
Duration	**: One hour thirty minutes**		
Course Code	**: MATH2305**	**Section(s)**	**: AM**
Course Title	**: Probability & Statistics, Laplace Transform**		

This Question Paper Consists of **3 (three)** Printed Pages (Including Cover Page) with **3 (Three)** Questions.

Course Learning Outcome(CLO)	
CLO1	Demonstrate understanding of descriptive statistics by practical application of quantitative reasoning and to the solution of engineering problems with data visualization.
CLO2	Compute and interpret the results of standard deviation, variance, co-efficient of variation, correlation and regression.

Bloom's Levels of the Questions					
Letter Symbol	**R**	**A**	**ANA**	**E**	**C**
Meaning	**Remember (5)**	**Apply(5)**	**Analysis(5)**	**Evaluation(10)**	**Create (5)**

INSTRUCTION(S) TO CANDIDATES

DO NOT OPEN UNTIL YOU ARE ASKED TO DO SO

- This is a Closed Book, Closed Notes Examination.
- Do not open until You Are Asked to Do So.
- Attempt All Questions. All Questions Carry Equal Marks.
- Show All Your Work And Draw The Free Body Diagram Where Necessary To Get Maximum Credit.
- Use of Programmable or Graphical Calculator is Strictly Not Allowed.
- Mobile Phones and Other Electronic Devices are Prohibited in the Exam Hall.
- **Work Can Be Done Using Pencil Or Pen, But The Final Answer Must Be Written In Pen**

Note: Any form of cheating or attempt to cheat is a serious offence, which may lead to dismissal

QUESTION 1 (10 marks)_

a) Define the classical definition of the probability. And find the probability of throwing a dice (six faced) and the possibility of getting $(i)2, (ii)$an even number. 4 marks

b) An article manufactured by a company consists of two parts A and B. In the process of manufacture of part-A, 10 out of 100 are likely to be defective. Similarly, 6 out of 100 are likely to be defective in the manufacture of part-B. Calculate the probability that the assembled article will not be defective (assuming that the events of finding the part A non-defective and that of B are independent). 3 marks

c) The probability that machine A will be performing an usual function in 10 years' time is 1/5, while the probability that machine B will still be operating usefully at the end of the same period is 1/4. 3 marks

Find the probability in the following cases:

(i). Both the machines will be performing usual function.

(ii). Neither will be operating.

(iii). Only the machine B will be operating.

(iv) At least one of the machines will be operating.

QUESTION 2 (10 marks)_

a) If $E_1, E_2, E_3, \cdots\cdots E_n$ are exclusive events with $P(B_i) \neq 0, for\ (i = 1,2,3, \cdots\cdots n)$ of a random experiment then for any arbitrary event A of the sample space of the above experiment with $P(A) > 0$, we have 7 marks

$$P\left(\frac{E_i}{A}\right) = \frac{P(E_i)P\left(\frac{A}{E_i}\right)}{\sum_{i=1}^{n} P(E_i)P\left(\frac{A}{E_i}\right)}$$

b) An urn I contains 3, white and 4 red balls and an urn II contains 5 white balls and 6 red balls. One ball is drawn at random from one of the urns and is found to be white. Find the probability that it was drawn from urn I. 3 marks

QUESTION 3 (10 marks)_

a) Differentiate between discrete Binomial and discrete distribution Poisson Distribution. 2 marks

b) Prove that the Poisson distribution is: $P(r) = \frac{m^r e^{-m}}{r!}$,where m is the mean of the distribution. 6 marks

c) Find the probability of getting 4 heads in 6 tosses of a fair coin by using the Binomial distribution. 2 marks

OR

a) The number of arrivals of customers during any day follows Poisson distribution with a mean of 6. What is the probability that the total number of customers on two days selected at random is less than 3? 3 marks

b) A function $f(x)$ is defined by: 5 marks

$$f(x) = \begin{cases} 0 & ,if\ x < 3 \\ \frac{1}{8}(x+3) & ,if\ 3 \leq x \leq 4 \\ 0 & if, x > 4 \end{cases}$$

Verify that it is a probability density function

c) Define Conditional Probability. 2 marks

End of the Mid Term Questions