

# International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in CSE

Final Exam, Spring 2022

Course Code: STAT 2311

Course Title: Probability and Statistics

Time: 2 hours 30 minutes

Full Marks: 50

(i) The figures in the right-hand margin indicate full marks

(ii) Course Outcomes and Bloom's Levels are mentioned in additional Columns

Bloom's Levels of the Questions						
Letter Symbols	R	U	App	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

## Part A

[Answer the questions from the followings]

1. a) What is correlation and correlation coefficient? How to interpret a correlation coefficient? Explain various types of correlation with the help of scatter diagrams. CO2 An 4

Or,

1. a) What is linear regression? State some uses of regression in engineering statistics. Distinguish between correlation coefficient and regression coefficient. CO2 An 4

1. b) The following table gives information on ages and cholesterol levels for a random sample of six men. CO2 E 6

Age	48	59	43	63	52	41
Cholesterol level	184	205	193	154	213	185

(i) Compute the correlation coefficient between age and cholesterol level.

(ii) Find the regression of cholesterol level on age.

(iii) Predict the Cholesterol level of 65 years-old man.

2. a) Explain the followings with example: (i) Random experiment; (ii) Sample space; (iii) Conditional Probability and (iv) Independent event. CO3 U 4

2. b) A computer center has 120 computers which are collected from three companies A, B, and C. The selected computers from these companies are 50, 40 and 30 respectively. The probabilities of trouble which is faced in these computers daily are 0.20, 0.25, and 0.35 respectively. One day during work a computer is found defective. What is the probability that it was collected from company B? CO3 E 6

Or,

2. b) Suppose that  $P(A|B) = 0.2$ ,  $P(A|B') = 0.3$  and  $P(B) = 0.8$ . Are A and B independent? Determine the followings: (i)  $P(A)$ , (ii)  $P(A \cup B)$ , (iii)  $P(A'B)$  CO3 E 6

### Part B

[Answer the questions from the followings]

3. a) What does the expected value of a random variable measure? Could the expected value be negative? State four important properties of variance of a random variable. CO3 An 4

3. b) Suppose that in a certain region of a country the daily rainfall (in inches) is a continuous random variable  $X$  with probability density function  $f(x)$  given by CO3 E 6

$$f(x) = \frac{3}{12}(6x - 3x^2) \quad , 0 < x < 2$$

Find the probability that at a given day in this region, the rainfall is (i) not more than 1.5 inches. (ii) between 0.5 and 1.5 inches. Also calculate mean and variance of the daily rainfall (in inches).

Or,

3. b) A continuous random variable  $X$  has the following probability density function,  $f(x) = \frac{1}{24}(x^2 + 1); 1 < x < 4$  CO3 E 6

Compute (i) the value of  $E(X)$  (ii)  $SD(X)$  (iii)  $P(x < 2.5)$  and (iv)  $P(x > 2.3)$

4. a) What are the parameters of a binomial distribution? Why are they so called? Define normal probability distribution with its importance. CO3 U 4

Or,

4. a) What are the inherent assumptions of binomial distribution? Under what conditions will binomial distribution tend to poisson distribution? Write some practical situations suitable for poisson distribution. CO3 U 4

4. b) The number of Website visitors per hour follows Poisson distribution with parameter  $m = 3$ . Find the probability that (i) No people visit the website in a particular hour (ii) Exactly one visitor visit the website (iii) At most visitor visit the website CO3 E 6

5. a) Discuss the different steps of formulation of a test of hypothesis. Write some applications of  $\chi^2$ -test? CO4 An 4

5. b) The following contingency table shows the classification of 200 peoples according to the gender and reference of colour: CO4 C 6

Colour	Gender	
	Male	Female
Green	40	60
White	35	25
Yellow	25	15

Test whether there is any relationship between gender and preference of colour at  $\alpha=0.01$

Note: At 1% level of significance tabulated value of Chi-square @ 2 df = 9.21



**International Islamic University Chittagong**  
 Dept. of Computer Science & Engineering  
 Final examination, Spring-2019  
 Course code: STAT-2311  
 Course Title: Statistics and Probability

**Total Marks: 50**

**Time: 2.30 hours**

*[Answer any Two questions from Group-A and any three questions from Group-B;  
 Separate answer script must be used for Group-A and Group-B]*

**Group-A**

1.(a) What is model in regression? How do you explain the regression model of  

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \dots + \epsilon$$
 2

1.(b) A researcher carefully computes the correlation coefficient between two variables and gets  $r = 1.06$ . What does this value mean? Interpret the following correlation coefficients: (i)  $r = 0.9$ ; (ii)  $r = -0.4$ ; (iii)  $r = 1$ ; (iv)  $r^2 = 0.90$  4

1.(c) An article in the IEEE Transactions on Instrumentation and Measurement described the use of a simple linear regression model to express drain current  $y$  (in milliamperes) as a function of ground-to-source voltage  $x$  (in volts). The data are as follows: 4

$y$	0.73	0.88	1.04	1.19	1.35	1.50	1.66	1.81
$x$	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8

- (i) Fit a simple linear regression model to these data.  
 (ii) Estimate the value of  $y$  when voltage of  $x = 2.4$

2.(a) What is scatter diagram? Create scatter diagrams to show possible forms for the following values of the product moment correlation coefficient,  $r$ . 5  
 (i)  $r = 0.8$ , (ii)  $r = -1$ , (iii)  $r = -0.75$ , (iv)  $r = 0$

2.(b) Eight students in an intelligent test were ranked by two examiners  $E_1$  and  $E_2$  in the following order: 5

$E_1$	5	1	2	4	7	8	3	6
$E_2$	6	2	1	3	4	7	5	8

Calculate rank correlation coefficient and comment.

3.(a) Distinguish between (i) Sample Space and Event; (iii) Conditional probability and Independent 5  
 3.(b) The distribution of number of stores according to size in 3 areas is given in following table: 5

Area	Store size		
	Large(L)	Medium(M)	Small(S)
A	30	45	75
B	150	125	275
C	20	130	150

Find the probabilities (i)  $P(M)$ ; (ii)  $P[CM]$  (iii)  $P(B \cup L)$  and (iv)  $P(A | M)$  (v) Are the events A and L independent?

**Group-B**

4.(a) Explain the terms: (i) Random variable (ii) Mathematical expectation and (iii) Probability 5

density function.

- 4.(b) Suppose that in a certain region of a country the daily rainfall (in inches) is a continuous random variable  $X$  with probability density function  $f(x)$  given by

$$f(x) = \frac{3}{12}(6x - 3x^2) \quad , 0 < x < 2$$

Find the probability that at a given day in this region the rainfall is (i) not more than 1.5 inches. (ii) between 0.5 and 1.5 inches. Also calculate mean and variance of the daily rainfall (in inches).

- 5.(a) Define Standard normal variate. Write down the important properties of normal distribution. 4  
5.(b) The phone lines to an airline reservation system are occupied 40% of the time. Assume that the events that the lines are occupied on successive calls are independent. Assume that 10 calls are placed to the airline. (i) What is the probability that for exactly three calls the lines are occupied? (ii) What is the probability that for at least one call the lines are not occupied? (iii) What is the expected number of calls in which the lines are all occupied? 6

- 6.(a) Discuss the different steps of formulation of a test of hypothesis. Write some applications of  $\chi^2$ -test? 4

- 6.(b) The following contingency table shows the classification of 200 peoples according to the gender and preference of city:

City	Gender	
	Male	Female
Dhaka	60	40
Chittagong	25	35
Barisal	25	15

Test whether there is any relationship between gender and preference of city at  $\alpha=0.05$

- 7.(a) What is mean mutually exclusive event? Consider two events A and B such that  $P(A) = \frac{1}{8}$ ,  $P(A|B) = \frac{1}{4}$  and  $P(B) = \frac{1}{6}$ . Examine the following statements and comment on the validity of each of these: 5

- (i) A and B are independent (ii) A and B are mutually exclusive  
(iii) Find the value of  $P(A \cup B)$

- 7.(b) A discrete random variable X has the following probability function:

X	0	1	2	3
f(X)	0.20	?	0.35	0.20

For what value of  $f(1)$  the function will be a probability function? Also find (i)  $P[X \leq 2]$ , (ii)  $P[X > 1]$ ; (iii)  $E[3X]$  and (iv) S.D [X]

\*THE END\*