

International Islamic University Chittagong (IIUC)
Department of Computer and Communication Engineering (CCE)
Semester End Examination
Autumn-2024

Course Code: STAT 2401

Course Title: Statistics

Full Marks: 50

Time: 2 hours 30 minutes

- (i) The figure in the right-hand margin indicate full marks
(ii) Course Outcomes and Bloom's Level are mentioned in additional Columns

CO1	Demonstrate understanding of descriptive Statistics and the solution of engineering problems with data visualization.
CO2	Will be able to compute and interpret the results of correlation and regression and probability theory.
CO3	Demonstrate probability and its related distributions to the solution of engineering problems.
CO4	Create hypothesis of data analysis related with engineering problems.

Bloom's Level 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) Define correlation coefficient. A research project in the Walton company of Bangladesh was undertaken to determine relationship between the years of service and the efficiency score of the engineers. The sample results were as follows: CO2 C 5

Engineers	A	B	C	D	E	F	G	H
Years of service	10	8	5	4	12	15	11	7
Efficiency score	12	9	7	5	13	14	16	4

- i. Draw a scatter diagram for the above data.
ii. Compute the correlation coefficient and comment.

- b) What is rank correlation? In a poem recitation competition, seven participants were recorded following marks by two different judges X and Y. CO2 App 5

X	10	20	35	14	18	21	16
Y	15	25	18	19	20	26	27

Compute rank correlation coefficient and comment.

2. a) What is scatter diagram? Illustrate the different values of r with the help of scatter diagram. CO1 E 5
b) Define regression analysis. A company manufactures an electronic device to be used in a very wide temperature range. The company knows that increased CO2 E 5

temperature shortens the life time of the device, and a study is therefore performed in which the life time is determined as function of temperature. The following data is found:

Temperature(in Celsius):x	10	20	20	40	50	60	70	80	90
Life time (in hours):y	420	365	285	220	176	117	69	34	5

- i. Fit the regression line of life time on temperature.
- ii. Estimate the life time of electronic device when temperature is 95°Celsius.

OR

2. a) Define sample space. Usually, Mr. Anan eats burger or sandwich or both in his evening meal. The probability to eat burger is 0.64, to eat sandwich is 0.46 and eat both is 0.3. Now find the probability that he will take at least one food. CO2 E 5
- b) Define probability, mutually exclusive events and independent events. One hundred twenty (120) students of EEE department sit an exam and the following data is recorded; CO2 E 5

	Student passed the Math Course	Student failed the Math Course	Total
tudents passed the CSE Course	50	20	70
tudents failed the CSE Course	30	20	50
Total	80	40	120

Now find the probability that

- (i) A student passed the math course
- (ii) A student passed the only CSE course
- (iii) A student passed at least one course

Part-B

[Answer the questions from the followings]

3. a) Define random variable. The number of computer sold per day at a local computer store, along with the corresponding probabilities, is shown in the table below: CO3 App 5

No. of computer sold: X	0	2	5	7	9
Probability: p(x)	0.10	0.20	0.30	k	0.15

- i) Find the value of k.
 - ii) Find $p(x \leq 2)$ and $p(x \geq 7)$
 - iii) Find the expected number of computer sold per day.
- b) Define mean of a random variable. Suppose that in a certain region of a country the daily rainfall (in inches) is a continuous random variable X with probability density function $f(x)$ is given by Co2 E 5

$$f(x) = \frac{3}{4}(2x - x^2); 0 \leq x \leq 2$$

Find the expected daily rainfall in that region.

4. a) What is meant by test of hypothesis? Write the steps of testing hypothesis. CO3 R 5
 b) Distinguish between type-I and type-II error. An automobile tyre manufacturer claims that the average life of a particular grade of tyre is 25 months. A random sample of such tyre gives the following value
 Life in month: 24, 26, 30, 20, 20, 18
 Can the manufacturer's claim to be valid at 1% level of significance? The tabulated value of t with 5 d.f at 1% level of significance is 4.032
5. a) Define Poisson distribution. Write the properties and application of this distribution. CO4 C 5
 b) If 3% of the electric bulbs manufactured by a company are defective, find the probability that in a sample of 100 bulbs- CO4 E 5
 i. None will be defective
 ii. Exactly 2 will be defective
 iii. At least 1 will be defective

OR

5. a) What are the steps of test procedure? An automobile company usually produces three-cylinder model car whose mean petrol consumption is 15 km/liter. But company launches a new four-cylinder car whose mean petrol consumption is claimed to be lower than that of existing auto engine. It is found that the mean consumptions of 20 sampled cars are 20 km/liters with an standard deviation 1.5 km/liter. Test for the hypothesis at 5% level of significant whether the new models petrol consumptions is equal to the existing model. (The tabulated t-value with 19 df is 2.093) CO4 C 5
 b) The following data represent the blood sugar of a group of patients before (B) and after (A) a specific treatment; CO4 E 5
- | | | | | | | | |
|-----------------|------|------|------|------|------|------|------|
| Blood Sugar (B) | 14.2 | 14.6 | 15.6 | 12.0 | 13.8 | 15.5 | 18.0 |
| Blood After (A) | 10.0 | 09.5 | 11.0 | 10.2 | 08.6 | 10.2 | 15.6 |
- (i) Now formulate the null hypothesis to test the treatment is successful or effective.
 (ii) Write the test statistic to verify the effectiveness of the treatment.
 Test the null hypothesis mentioned in (i) and comment.