International Islamic University Chittagong

Department of Economics & Banking
Midterm Examination
Program: BSS(Hons.) in E&B
Semester: Spring-2024

Course Title: Statistical Analysis **Time: 1.5 Hours**
Course Code: STAT-2402 **Full Marks: 30**

[NB: Answer the following questions. All parts of a question must be answered serially. Figures in the right margin indicate full marks.]

QN	Description of Question	Marks	CLOs & PLOs	Cognitive Learning
1(a)	Define the following with examples: random experiment, sample space, mutually exclusive and non-mutually exclusive events.	3	CLO-1 PLO-1	Remembering/ Understanding
1(b)	A lot of 10,000 parts produced on four machines were inspected and classified into three grades. The results were given in the following table:			Evaluating

Grade	Machine			
	I	II	III	IV
Satisfactory	2400	1600	2400	1600
Rework	450	300	450	300
Scrap	150	100	150	100

If a part is selected at random from this lot, then find the following probabilities that:

(i) it is produced by machine II;
(ii) it is produced on machine III given that it is scrapped
(iii)it is scrapped given that it is produced on machine I;
(iv)a satisfactory part is produced on machine II.

2(a)	State additive and multiplicative law of probability for two events A and B.	2	CLO-1 PLO-1	Understanding /Remembering
2(b)	The manufacturing firm operates three plants that make steel pipes. The daily output capacities of these plants are 500, 1,000, and 2,000 units, respectively. Based on records, the three plants have defect rates of 0.005, 0.004, and 0.010, respectively. Given that a randomly picked pipe from a day's total production is determined to be defective, what is the likelihood that the first plant produced it?	4		Evaluating
2(c)	In a city, there are 1200 business firms. According to a survey it is seen that 760 firms offer their employee health insurance, 650 offer dental insurance, and 285 offer health insurance and dental insurance. A firm is selected at random from the city. What is the probability that the selected firm offers (i) at least one insurance (ii) only one insurance	4		
3(a)	Define random variable, probability distribution and probability function with a suitable example. State the conditions of a probability function.	3	CLO-1 PLO-1	Understandin

3(b) A continuous random variable has the following probability density function $f(x) = kx^2$, $0 \leq x \leq 2$. 7 Evaluating

(i) Find the value of k.

Find the probability of

(ii) $P[0.2 \leq X \leq 0.9]$,

(iii) $P[X < 0.5]$,

(iv) $P[1.25 < X < 1.75]$,

(v) $P[X > 0.75]$.

OR

3(a). Define mathematical expectation for discrete random variable. Elucidate the properties of mathematical expectation and variance of a random variable. 3 CLO-1 PLO-1 Understanding /Analyzing

3(b) Suppose a lot contains 5 items. Let the random variable X denotes the number of defective items in the lot. Suppose the probability function of the random variable X is 7 Evaluating

Values of X: x	0	1	2	3	4
P(x)	0.40	0.30	-	0.05	0.10

(i) Find the missing value of defective item 2.

(ii) Find the expected number of defective items in the lot.

(iii) Also find variance and standard deviation.