Registration No: -

2	2	0	1	2	0	2	4	5	5

Total Number of Pages: 03

B. Tech / 22CM3BS01T

3rd Semester Regular Examination: 2023-24
MATHEMATICS-III
BRANCH: CSE, CST, ECE, ELC, IT
Time: 3 Hours
Max Marks: 100
Q Code: P082

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q No.		CO	Level		
Q1				**Short Answer Type Questions (Answer All-10)**	(02x10)
	a)	1	2	Suppose that we have a fuse box containing 20 fuses, of which 5 are defective. If2 fuses are selected at random and removed from the box in succession withoutreplacing the first, what is the probability that both fuses are defective?	2
	b)	1	1	What do you mean byjoint probability distribution function?	2
	c)	2	2	Write any two properties of the density curve of normal distribution.	2
	d)	2	2	Poisson distribution is of discrete or continuous type? Justify your answer.	2
	e)	3	2	Define the prediction interval for a normal distribution with known variance.	2
	f)	2	1	Definerandom sampling with example.	2
	g)	3	2	What do you mean by Goodness of fit (write briefly)?	2
	h)	3	2	Define one tailed test and two tailed tests.	2
	i)	4	2	What is scatter diagram? Describe scatter diagram with an example.	2
	j)	4	2	Define Karl Pearson Coefficient of Correlation.	2

Part-II

Q No.		CO	Level		
Q2				**Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	(06x08)
	a)	1	3	A continuous random variable X has the probability density function $f(x) = \frac{3}{4}(x^2 + 1), 0 \leq x \leq 1$. Find a such that $P(X \leq a) = P(X > a)$.	6
	b)	1	3	A shipment of 7 television sets contains 2 defective sets. A hotel makes a random purchase of 3 of the sets. If x is the number of defective sets purchased by the hotel, find the probability distribution of X.	6
	c)	2	4	If 10% of the truck drivers on road are drunk, determine the probability that out of 400 drivers randomly checked (a) at most 32, (b) more than 49 are drunk on the roads.	6

d) 1 1 From the joint distribution table 6

Y → / X ↓	0	1	2	3
0	0	1/8	1/4	1/8
1	1/8	1/4	1/8	0

Find

(i) Marginal distribution of X and Y.
(ii) Expectations of X and Y.
(iii) Co-varience of X and Y.

e) 2 4 If X is uniformly distributed in $-2 \le x \le 2$, find 6

(i) $P(X < 1)$,

(ii) $P(|X - 1| \ge 1/2)$.

f) 3 4 Define t-distribution, and use this to find 6

(i) $P(t < 2.365)$ when $\nu = 7$,

(ii) $P(t > 1.318)$ when $\nu = 24$

(iii) $P(-1.356 < t < 2.179)$

with $\nu = 12$, where ν is the degree of freedom.

g) 3 4 The average zinc concentration recovered from a sample of zinc measurements in36 different locations are found to be 2.6 grams per millilitre. Find the 95% and 99%confidence intervals for the mean zinc concentration in the river. Assume that thepopulation has standard deviation 0.3. 6

h) 4 3 Find the rank coefficient of correlation of two variables in the given table 6

X	86	61	74	41	91
Y	94	76	66	51	81

i) 3 4 Test the hypothesis $\mu = 0$ against the alternative $\mu > 0$, assuming normally and using the sample 1, -1, 1, 3, -8, 6, 0. (Choose $\alpha = 5\%$) 6

j) 3 3 The length of life X of certain computers is approximately normally distributed with mean 800 hours and standard deviation 40 hours. If a random sample of 30 computers has an average life of 788 hours, test the null hypothesis that $\mu = 800$ hours against the alternative that $\mu \neq 800$ hours at (i) 0.5% (ii) 1% level of significance. 6

k) 4 3 Find the regression line of y on x for the data (-2, 3.5), (0, 1.5), (2, 1), (4, -0.5), (6, -1). 6

l) 4 3 Calculate the coefficient of correlation between X and Y from the following data: 6

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

Part-III

Q No.		CO	Level		
Q3	a)	1	4	**Long Answer Type Questions (Answer Any Two out of Four)** (02x16) A businessman goes to the hotels X, Y, Z 20%, 50%, 30% of the time respectively. It is known that 5%, 4%, 8% of the rooms in the respective X, Y, Z hotels having faulty plumbing. I. Determine the probability that the businessman goes to hotel with faulty plumbing II. What is the probability that businessman's room having faulty plumbing is assigned to hotel Z?	8
	b)	1	4	Assume that 50% of all engineering students are good in mathematics. Determine the probabilities that among 18 engineering students (i) exactly 10, (ii) at least 10, (iii) at most 8, (iv) at least 2 and at most 9 are good in mathematics.	8
Q4	a)	1	4	Let the mileage (in thousands of miles) of a particular tyre be a random variable X having the probability density $f(x)=\begin{cases}\frac{1}{20}e^{-x/20}, x>0\\ 0, x\le 0\end{cases}$. Find the probability that one of these tyres will last (i) at most 10,000 miles, (ii) anywhere from 16,000 to 24,000 miles, (iii) at least 30,000 miles.	8
	b)	2	3	A pair of dice rolled 180 times. Determine the probability that a total of 7 occurs (i) at least 25 times, (ii) between 33 and 41 times inclusive, (iii) exactly 30 times.	8
Q5	a)	3	4	Explain testing of hypothesis.	8
	b)	3	4	Let X be a normal random variable with variance 9. Using a sample size 10 with mean $\bar{x}$, test the hypothesis $\mu=\mu_0=24$ against the three kinds of alternatives, (i) $\mu>\mu_0$, (ii) $\mu<\mu_0$, (iii) $\mu\neq\mu_0$.	8
Q6	a)	4	2	The following outcomes are recorded by throwing a die. Test the goodness of fit	8

Die shown	1	2	3	4	5	6
Frequency	22	24	38	30	46	44

b)	4	3	Obtain the rank correlation coefficient for the following data							8

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70