Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 20009

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2025

Fourth Semester

Biotechnology

U19MA408 – PROBABILITY AND STATISTICS

(Common to Biomedical Engineering)

(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	State chebyshev in equality.	2	K1	CO1
2.	A continuous random variable X has the probability density function $f(x) = Kx$,$0 < x < 1$. Find the value of K.	2	K2	CO1
3.	10 coins are thrown simultaneously. Find the probability of getting atleast 7 heads.	2	K2	CO2
4.	Why Poisson distribution limiting case of binomial distribution?	2	K1	CO2
5.	Distinguish between correlation and regression.	2	K2	CO3
6.	Find K if the joint distribution of X and Y is f(x,y)=k(x+y), x =1,2,3 and y =1,2.	2	K1	CO3
7.	What is meant by Point Estimation?	2	K1	CO4
8.	State the confidence intervals for parameter in one sample from normal population.	2	K2	CO4
9.	Define critical region.	2	K2	CO5
10.	What are Type – I and Type – II errors?	2	K1	CO5

PART – B

(5 x 16 = 80 Marks)

Q.No.			Questions	Marks	KL	CO
11	a)		A random variable X has the probability function given below X: 0, 1, 2, 3, 4, 5, 6, 7, 8 P(X): a, 3a, 5a, 7a, 9a, 11a, 13a, 15a, 17a Find a. The value of 'a'. b. P(X<3) c. P(0<X<5) d. The distribution function of X .	16	K3	CO1
			(OR)			
	b)	i.	A continuous random variable X has the probability density function $f(x)=K(x-x^2),\ 0<x<1$. Find the value of K, mean and variance.	8	K3	CO1
		ii.	A pair of dice is tossed twice. Find the probability of scoring 7 points (a) once (b) atleast twice (c) twice.	8	K3	CO1
12	a)	i.	State and prove the memoryless property of exponential distribution.	8	K4	CO2
		ii.	It is known that the probability of an item produced by a certain machine will be defective is 0.05. If the produced item was sent to the market in packets of 20, find the number of packets containing atleast, exactly and atmost 2 defective items in consignment of 1000 packets by using Poisson approximation.	8	K3	CO2
			(OR)			
	b)	i.	If 10% bolts produced by a machine are defective, determine the probability that our of 10 bolts chosen at random (a) one will be defective (b) atleast one will be defective and (c) atmost two will be defective.	8	K3	CO2
		ii.	Trains arrive at a station at 15 minutes intervals starting at 4 a.m. If a passenger arrives at a station at a time that is uniformly distributed between 9.00 and 9.30, find the probability that he has to wait for the train for (1) less than 6 minutes (2) more than 10 minutes.	8	K3	CO2
13	a)		Suppose that the 2D RVs (X,Y) has the joint pdf $f(x,y)=\begin{cases} x+y, & 0<x<1, 0<y<1 \\ 0 & otherwise \end{cases}$ Obtain the correlation coefficient between X and Y. Check whether X and Y are independent.	16	K5	CO3
			(OR)			

X	0	1	2	3	4	5	6	7	8
P(X)	a	3a	5a	7a	9a	11a	13a	15a	17a

	b)	i. The joint pdf of the RV (X,Y) is given by $f(x,y) = Kxye^{-(x^2+y^2)}$ $x>0, y>0$. Find the value of K and prove that X and Y are independent.		8	K5	CO3
		ii. A random same of size 100 is taken from a population whose mean is 60 and the variance is 400. Using CLT, with what probability can we assert that the mean of the sample will not differ from $\mu = 60$ by more than 4?		8	K5	CO3
14	a)	For the random sampling from normal population $N(\mu,\sigma^2)$ find the maximum likelihood estimators for i. μ When σ^2 is known ii. σ^2 When μ is known iii. The simultaneous estimation of μ and σ^2		16	K3	CO4
		(OR)				
	b)	i. Prove that for a random sample of size n taken from an infinite population, $s^2 = \frac{\sum(x_i - \bar{x})^2}{n}$ is not unbiased estimator of σ^2. Find an unbiased estimate of σ^2.		8	K3	CO4
		ii. The mean muscular endurance score of a random sample of 60 subjects was found to be 145 with standard deviation of 40. a. Construct 95% and 99% confidence intervals for the true mean. b. What size of sample is required to estimate the mean within 5 of the true mean with 95% confidence?		8	K3	CO4
15	a)	i. A sample of 900 members has mean 3.4 cm and standard deviation 2.61cm. Is the sample from a large population of mean 3.25 cm and standard deviation of 2.61 cm? (Test at 5% level of significance).		8	K3	CO5
		ii. A random sample of 10 boys had the following I.Q's 70,120,110,101,88,83,95,98,107,100. Do these data support the assumption of a population mean I.Q of 100? Find a reasonable range in which most of them I.Q values of samples of 10 boys lie.		8	K3	CO5
		(OR)				
	b)	The nicotine contents in milligrams in two samples of tobacco were found to be as follows. Sample I : 24, 27, 26, 21, 25 Sample II : 27, 30, 28, 31, 22, 36 Can it be said that two samples come from same normal population.		16	K3	CO5