

**22MT2005 - PROBABILITY, STATISTICS & QUEUEING THEORY**

Set No: 3

**Time:****Max.Marks: 50**

S.NO Answer All Questions

Choice	Options	Marks	CO	CO BTL	COI BTL
1.	Answer all of the following Given $P(A)=0.35$ , $P(B)=0.65$ and $P(A \cap B) = 0.12$ , Find	12Marks	CO2	4	2
1.A.	i) $P(A \cup B)$ ii) $P(\bar{A} \cap B)$ iii) $P(A \cap \bar{B})$ vi) $P(\bar{A} \cap \bar{B})$	2Marks	CO1	3	2
1.B.	Summarize the concepts i) Types of random variables ii) Cumulative Distribution function	2Marks	CO1	3	2
1.C.	Demonstrate any two instances where Poisson distribution may be successfully employed.	2Marks	CO1	3	2
1.D.	Outline the importance of Central limit theorem in statistics.	2Marks	CO2	4	2
1.E.	A mathematics placement test is given to all entering freshmen at a small college. A student who receives a grade below 35 is denied admission to the regular mathematics course and placed in a remedial class. The placement test scores and the final grades for 20 who took the regular course were recorded as follows: Placement test: 50 35 35 40 55 65 35 60 90 35 90 80 Course grade: 53 41 61 56 68 36 11 70 79 59 54 91 Plot a scatter diagram.	2Marks	CO2	4	2
1.F.	A manufacturer of electronic components is interested in determining the lifetime of a certain type of battery. A sample, in hours of life, is as follows 123 116 122 110 175 126 125 111 118 117 (i) Determine the sample mean and median (ii) What feature in this data set is responsible for the substantial difference between the two?	2Marks	CO2	4	2
2.	Answer all of the following The probability that an integrated circuit chip will have defective etching is 0.06, the probability that it will have a crack defect is 0.03 and the probability that it has both defects is 0.02. Infer the probability a) that a newly manufactured chip will have either etching or a crack defect. b) that a newly manufactured chip will have neither defect. c) that a newly manufactured chip will have only one defective.	16Marks	CO2	4	3
2.A.		4Marks	CO1	3	3
2.B.	Illustrate bivariate discrete and bivariate continuous random variables in detail. The value of Karlpearson correlation (r) for the following data is 0.636.	4Marks	CO1	3	2
	x: 0.05 0.14 0.24 0.30 0.47 0.52 0.57 0.61 0.67 0.72				
2.C.	y: 1.08 1.15 1.27 1.33 1.41 1.46 1.54 2.72 4.01 9.63	4Marks	CO2	4	3
	i) Calculate the Spearman's rank correlation for this data. ii) Compare the advantage of $\rho$ brought out in this problem.				

J. J. Thomson discovered the electron by isolating negatively charged particles for which he could measure the mass/charge ratio. This ratio appeared to be constant over a wide range of experimental conditions and, consequently, could be a characteristic of a new particle. His observations, from two different cathode-ray tubes that used air as the gas, are

Tube 1: 0.57   0.34   0.43   0.32   0.48   0.40   0.40

2.D.

Tube 2: 0.53   0.47   0.47   0.51   0.63   0.61   0.48

4Marks CO2 4 3

Calculate the mean and standard deviation for tube 1 and tube 2 observations.

3. Answer all of the following

choice  
Q-4

11Marks CO1 3 3

A company uses three different assembly lines-A1, A2 and A3 –to manufacture a particular component. Of those manufactured by line A1, 5% need rework to remedy a defect, whereas 8% of A2's components need rework and 10% of A3's need rework. Suppose that 50% of all components are produced by line A1, 30% are produced by line A2, and 20% come from line A3. If a randomly selected component needs rework, Compute the probability that it came from line A1; From line A2 and From line A3.

3.A.

5Marks CO1 3 3

3.B. Inspect the situations in real life where the binomial distribution is likely to be realized and also describe the distribution in detail.

6Marks CO1 3 3

4. Answer all of the following

11Marks CO1 3 3

Let X be random variable with following probability distribution:

X	-3	6	9
f(x)	1/6	1/2	1/3

4.A.

5Marks CO1 3 3

Compute  $\mu_{g(x)}$  where  $g(X)=(2X+1)^2$ .

4.B. In the inspection of tin plate produced by a continuous electrolytic process, 0.2 imperfections is spotted per minute, on average. Obtain the probabilities of spotting i) one imperfection in 3 minutes; ii) at least two imperfections in 5 minutes; iii) at most one imperfection in 15 minutes.

6Marks CO1 3 3

5. Answer all of the following

choice  
Q-6

11Marks CO2 4 4

5.A. In an industrial process the diameter of a ball bearing is an important component part. The buyer sets specifications on the diameter to be  $3.0 \pm 0.01$  cm. The implication is that no part falling outside these specifications will be accepted. It is known

5Marks CO2 4 4

that in the process the diameter of a ball bearing has a normal distribution with mean  $\mu=3.0$  and standard deviation  $\sigma=0.005$ .  
On the average, obtain % of manufactured ball bearings will be scraped?

Examine the most likely price in Mumbai corresponding to the price of Rs. 70 at Kolkata from the following

	Kolkata	Mumbai
Average Price:	65	67
Standard deviation:	2.5	3.5

5.B.

6Marks CO2 4 3

Correlation coefficient between the prices of commodities in the two cities is 0.8.

6. Answer all of the following

11Marks CO2 4 4

The daily amount of coffee, in litres, is dispensed by a machine located in an airport lobby is a random variable 'X' having a continuous uniform distribution with A=7 and B=10. Inspect the probability that on a given day the amount of coffee dispensed by this machine will be i) at most 8.8 litres ii) more than 7.4 litres but less than 9.5 litres iii) At least 8.5 litres

6.A.

5Marks CO2 4 3

A researcher wished to determine if a person's age is related to the number of hours he or she exercises per week. The data obtained from a sample is given. Analyze your opinion based on Karl Pearson's coefficient of correlation for the data.

Age x:	18	26	32	38	52	59
Hours y:	10	5	2	3	1.5	1

6.B.

6Marks CO2 4 4