Question Paper Code: R18A22HS01

R18

ANURAG Engineering College

(An Autonomous Institution)

II B.Tech II Semester Supplementary Examinations, Fan/Feb–2024

PROBABILITY AND STATISTICS

(MECHANICAL ENGINEERING)

Time: 3 Hours **Max. Marks: 75**

Section – A (Short Answer type questions) (25 Marks)

Answer All Questions

		Course Outcome	B.T Level	Marks
1.	List axioms of probability	CO1	L1	2M
2.	Find the probability of drawing 2 red balls in succession from a bag containing 4 red and 5 black balls when the ball that is drawn first is not replaced	CO1	L1	3M
3.	If the probability of a defective bolt is 1/8, find the mean the distribution of defective bolts of 640.	CO2	L2	2M
4.	If a bank received on the average 6 bad cheques per day, find the probability that it will receive 4 bad cheques on any given day.	CO2	L2	3M
5.	Find the arithmetic mean of 25, 30, 21, 55, 47, 10, 15, 17, 45 and 35	CO3	L1	2M
6.	What the normal equations for fitting a straight line $y = a_0 + a_1x$	CO3	L1	3M
7.	Define Null Hypothesis and Alternate Hypothesis	CO4	L1	2M
8.	A random sample of size 100 has a standard deviation of 5. What can you say about the maximum error with 95 % confidence	CO4	L2	3M
9.	What is the test statistic for chi-square test for goodness of fit	CO5	L1	2M
10.	Illustrate the ANOVA table for one way classification	CO5	L2	3M

Section B (Essay Questions)

Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

11. A) In a certain college, 25% of boys and 10% of girls are studying mathematics. The girls constitute 60% of the student body. i) What is the probability that mathematics is being studied? ii) If a student is selected at random and is found to be studying mathematics then find the probability that the student is a girl. — CO1, L3, 10M

OR

B) A random variable X has the following probability function: — CO1, L2, 10M

x	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2+K$

Determine: i) K ii) mean iii) variance

12. A) 20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random i) none is defective ii) one is defective iii) $p(1<x<4)$ — CO2, L2, 10M

OR

B) In a normal distribution, 7% of the items are under 35 and 89 % are under 63. Determine the mean and variance of the distribution. — CO2, L3, 10M

13. A) Using the method of least squares, fit a second degree curve for the following data: — CO3, L3, 10M

x	10	12	13	12	16	15
y	40	38	43	45	37	43

OR

B) i) Find the correlation coefficient for the following data: CO3 L2 10M

X	9	8		6	5	4	3	2	1
Y	15	16	14	13	11	12	10	8	9

ii) Find the regression line of Y on X for the following data:

X	10	12	13	16	17	20	25
Y	10	22	24	27	29	33	37

14. A) The efficiency expert of a computer company tested 40 engineers to estimate the average time it takes to assemble a certain computer component, getting a mean of 12.73 minutes and S.D of 2.06 minutes. CO4 L3 10M

(a) If sample mean 12.73 is used as point estimate of the actual average time required to perform the task, determine the maximum error with 99% confidence.

(b) Construct 98% confidence intervals for the true average time it takes to do the job.

(c) With what confidence can we assert that the sample mean does not differ from the true mean by more than 30 seconds.

OR

B) A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38. Also calculate 95% confidence interval for the population. CO4 L3 10M

15. A) As a part of the investigation of the collapse of the roof of a building, a testing laboratory is given all the available bolts that connected the steel structure at 3 different positions on the roof. The forces required to shear each of these bolts (coded values) are as follows: CO5 L3 10M

Position1: 90 82 79 98 83 91

Position 2: 105 89 93 104 89 95 86

Position 3: 83 89 80 94

Perform an analysis of variance to test at the 0.05 LOS whether the difference among the sample means at the 3 positions are significant.

OR

B) The mean life of a sample of 10 electric bulbs was found to be 1456 hours with S.D. of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with S.D. of 398 hours. Test at 0.05 LOS that is there a significant difference between the means of two batches? CO5 L3 10M