Register Number:……..

B.E/B.TECH DEGREE EXAMINATIONS: NOV / DEC 2024

(Regulation 2018)

Fourth Semester

COMMON TO CSE, IT, ISE

U18MAI4201: Probability and Statistics

COURSE OUTCOMES

CO1: Compute correlation between variables,and predict unknown values using regression.
CO2: Understand and apply the concept of probability and random variables and predict probabilities of events in models following normal distribution.
CO3: Perform hypothesis testing and interpret the results.
CO4: Understand the principles of design of experiments and perform analysis of variance.
CO5: Sketch control charts and comment on the process control.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1.	State any two properties of correlation coefficient.	CO1	[K_1]
2.	If and are the regression lines of X on Y and of Y on X respectively then find the means of X and Y.	CO1	[K_2]
3.	A box contains 4 bad and 6 good tubes. Two are drawn out from the box at a time. One of them is tested and found to be good. What is the probability that the other one is also good?	CO2	[K_2]
4.	Obtain the standard deviation of X when the random variable X has the moment generating function $M(t)=\frac{3}{3-t}$.	CO2	[K_2]
5.	Define Type I and Type II error.	CO3	[K_1]
6.	Write down the expected frequencies of a 2×2 contingency table	CO3	[K_1]
7.	State the basic principles in the design of experiment.	CO4	[K_1]
8.	Why a 2X2 Latin square is not-possible? Explain briefly.	CO4	[K_1]
9.	Write the formulae for central line, Upper control limit (UCL) and Lower control limit	CO5	[K_1]

a	b
c	d

(LCL) of a $\overline{X}$ - chart.

10. Find the lower and upper control limits for the c chart, when $\bar{c} = 6$. CO5 [K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. a) Ten students got the following percentage of marks in Mathematics and Physical sciences: 8 CO1 [K_2]

Students:	1	2	3	4	5	6	7	8	9	10
Marks in Mathematics:	78	36	98	25	75	82	90	62	65	39
Marks in Physical Sciences:	84	51	91	60	68	62	86	58	63	47

Calculate the rank correlation coefficient.

b) If the legible results from a partially destroyed laboratory record of an analysis of correlation data are, variance of X = 1; $6x + y = 31$ and $3x + 2y = 26$ and are the regression equations then find the following: 8 CO1 [K_3]

(i) The means values of X and Y

(ii) The standard deviation of Y

(iii)The correlation coefficient between X and Y.

12. a) A bolt is manufactured by 3 machines A, B and C. A turns out twice as many items as B, and machines B and C produce equal number of items. 2% of bolts produced by A and B are defective and 4% of bolts produced by C are defective. All bolts are put into 1 stock pile and 1 is chosen from this pile. What is the probability that it is defective? 8 CO2 [K_3]

b) A random variable X has the following probability distribution 8 CO2 [K_3]

X:	-2	-1	0	1	2	3
p(X):	0.1	k	0.2	2k	0.3	3k

(i) Find the value of k, $P(X < 2)$, $P(-2 < X < 2)$, (ii) Find the cumulative distribution function of X and (iii) Evaluate the mean of X.

13. a) The mean lifetime of a sample of 25 bulbs is found as 1550 hours with a standard deviation of 120 hours. The company manufacturing the bulbs claims that the average life of their bulbs is 1600 hours. Is the claim acceptable at 5% level of significance? 8 CO3 [K_3]

b) The number of aircraft accidents that occurred during the various days of a week are tabulated below: Test whether the accidents are uniformly distributed over the week. 8 CO3 [K_3]

Day	Mon	Tue	Wed	Thur	Fri	Sat
No. of accidents	15	19	13	12	16	15

14. a) Analyse the variance in the following Latin square of yields(in kgs) of paddy where A, B, C, D denote the different methods of cultivation: 16 CO4 [K_3]

D122	A121	C123	B122
B124	C123	A122	D125
A120	B119	D120	C121
C122	D123	B121	A122

Examine whether the different methods of cultivation have given significantly different yields.

15. a) Given below are the values of sample mean $\bar{X}$ and sample range R for 10 samples, each of size 5. Draw the appropriate mean and range charts and comment on the state of control of the process. 16 CO5 [K_3]

Sample No:	1	2	3	4	5	6	7	8	9	10
Mean:	43	49	37	44	45	37	51	46	43	47
Range:	5	6	5	7	7	4	8	6	4	6

16. a) Compute the coefficients of correlation between X and Y using the following data: 8 CO1 [K_2]

X:	65	67	66	71	67	70	68	69
Y:	67	68	68	70	64	67	72	70

b) The marks obtained by a number of students in a certain subject are approximately normally distributed with mean 65 and standard deviation 5. If 3 students are selected at random from this group, what is the probability that at least 1 of them would have scored above 75? 8 CO2 [K_3]

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