Register Number:……..

KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: APRIL / MAY 2023

(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.

C06: Apply the above concepts to solve problems using R Studio.

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

Answer all the Questions: -
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1. Write the properties of Correlation Co-efficient. CO1 [K_1]
2. State the axioms on Probability. CO2 [K_1]
3. If X and Y are the independent random variables with variances 2 and 3 respectively, find the variance of 3X+4Y. CO2 [K_2]
4. State the properties of Normal Distribution. CO2 [K_1]
5. A sample of 200 persons with a particular disease was selected. Out of these, 100 were given a drug and the others were not given any drug. The results are as follows: CO3 [K_2]

No. of persons	Drug	No drug
Cured	65	55
Not cured	35	45

Find the Chi-square Value.

6. Define type-I and type-II errors on Testing of Hypothesis. CO3 [K_1]
7. Write the three basic principles of an Experimental Design. CO4 [K1]

8. A completely Randomized Design experiment with ten plots and three treatments gave the results given below. Find the Correction Factor (C.F). CO4 [K2]

Treatments	Replications			
A	5	7	1	3
B	4	4	7	
C	3	1	5	

9. Define Statistical Quality Control. CO5 [K1]

10. Write the Control Limits for the number of defectives (np-chart). CO5 [K1]

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

11. a) Calculate the rank correlation coefficient between marks in the selection test (x) and the proficiency test (y) of 9 recruits. (8) CO1 [K3]

S.No.	1	2	3	4	5	6	7	8	9
x:	10	15	12	17	13	16	24	14	22
y:	30	42	45	46	33	34	40	35	39

b) Marks obtained by 10 students in Mathematics (x) and Statistics (y) are given below: (8) CO1 [K3]

x:	60	34	40	50	45	40	22	43	42	64
y:	75	32	33	40	45	33	12	30	34	51

Find the two regression lines. Also find y when x = 55.

12. a) In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total. Of their output 5,4,2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B and C? (8) CO2 [K2]

b) A random variable X has the probability function. (8) CO2 [K3]

$f(x) = \frac{1}{2^x}$, x=1, 2, 3,..... Find its (i) Moment Generating Function, (ii) Mean.

13. Two random samples gave the following results: (16) CO3 [K_3]

Sample	Size	Sample Mean	Sum of the square of deviations from Mean
1	10	15	90
2	12	14	108

Examine whether the samples come from the same normal population at 5% level of significance.

14. Analyze the variance in the Latin square of yields (in kgs.) of paddy where P, Q, R, S denote the denote the different methods of cultivation. (16) CO4 [K_3]

S122	P121	R123	Q122
Q124	R123	P122	S125
P120	Q119	S120	R121
R122	S123	Q121	P122

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

15. The measurements are given below with 5 samples each containing 5 items at equal intervals of time. Construct $\overline{X}$ and R charts and comment on the state of control (16) CO5 [K_3]

Sample Number	Measurements				
1	46	45	44	43	42
2	41	41	44	42	40
3	40	40	42	40	42
4	42	43	43	42	45
5	43	44	47	47	45

16. a) In a test of 2000 electric bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040hrs and SD of 60 hrs. Estimate (i) The number of bulbs likely to burn for (i) more than 2150hrs, (ii) less than 1950hrs and (iii) more than 1920 hrs but less than 2160hrs. (8) CO2 [K_3]

b) Two researchers adopted different sampling techniques while investigating the same group of students to find the number of students falling into different intelligence levels. The results are as follows: (8) CO3 [K_3]

Research	Below average	Average	Above average	Excellent	Total
X	86	60	44	10	200
Y	40	33	25	2	100
Total	126	93	69	12	300

Would you say that the sampling techniques adopted by the two researchers are significantly different?

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