KUMARAGURU
college of technology
character is life

B. TECH DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Fifth Semester

FASHION TECHNOLOGY

U18MAT5102: Probability and Statistics

(Statistical Tables required)

COURSE OUTCOMES

CO1:	Compute measures of central tendencies, dispersion, and correlation between variables, and predict unknown values using regression.
CO2:	Understand and apply the concept of probability and random variables.
CO3:	Construct probabilistic models for observed phenomena through distributions, which play an important role in many engineering applications.
CO4:	Perform hypothesis testing and interpret the results.
CO5:	Understand the principles of design of experiments and perform analysis of variance.
CO6:	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.	If the marks of 5 students are 45, 92, 26, 81 and 72, find the range and coefficient of range.	CO1	[K2]

2.	Calculate the rank correlation coefficient between marks in the selection test (X) and the proficiency test (Y) of 9 recruits.	CO1	[K3]

X:	10	15	12	17	13	16	24	14	22
Y:	30	42	45	46	33	34	40	35	39

3.	Four persons are chosen at random from a group containing 3 men, 2 women and 4 children. Find the probability that exactly two of them will be children.	CO2	[K2]

4.	Find the moment generating function of the distribution whose probability mass function is $$p(x) = \begin{cases} q^x p, x = 0,1,2\ldots\ldots \\ 0, otherwise \end{cases}$$	CO2	[K4]

5.	For usual notation with binomial variate X, find p when n = 6 and $9P(x = 4) = P(x = 2)$.	CO3	[K3]

6.	A manufacturer of cotter pins knows that 5% of his product is defective. If he sells pins in boxes of 100 and guarantees that not more than 10 pins will be defective, what is the approximate probability that a box will fail to meet the guaranteed quality.	CO3	[K3]
7.	A simple sample of heights of 6400 Englishmen has a mean of 170 cm and a S.D. of 6.4 cm, while a simple sample of heights of 1600 Americans has a mean of 172 cm and a S.D. of 6.3 cm. Find the test statistic.	CO4	[K2]

8. 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: — CO4 [K2]

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

Find the test statistic.

9. A random sample is selected from each of 3 makes of ropes and their breaking strength are measured with the following results. — CO5 [K2]

I	70	72	75	80	83		
II	100	110	108	112	113	120	107
III	60	65	57	84	87	73	

Find total sum of squares.

10. The following data represents number of end breaks (per 100 spindle hours) observed on a ring frame on eight different days. — CO6 [K3]

Day no.	1	2	3	4	5	6	7	8
Number of end breaks	2	8	3	2	4	6	5	7

Find Control limit (CL) for c-chart.

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

11. a) 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
Y:	75	32	33	40	45	33	12	30	34

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

| | | | | | | | | | | | 8 | CO1 | [K4] |

| b) | Calculate mean, median and mode for the following data: |

Interval:	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency:	7	7	14	17	15	8	2

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 | [K4]

b) Find the mean, variance of the random variable X which has the following density function

$$f(x) = \begin{cases} x, & 0 < x < 1 \\ 2 - x, & 1 < x < 2 \\ 0, & \text{otherwise.} \end{cases}$$

8 | CO2 | [K4]

13. 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 | CO3 | [K3]

b) Fit a binomial distribution for the following data | 8 | CO3 | [K4]

x:	0	1	2	3	4	5	6
f:	5	18	28	12	7	6	4

14. a) Two random samples gave the following results: | 8 | CO4 | [K4]

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

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

b) In a sample of 1000 people in Mumbai, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance? | 8 | CO4 | [K3]

| 15. | a) | The following data represents the number of units of productions per day turned out by different workers using four different types of machines. | 8 | CO5 | [K₅] |

		Machine Type			
		A	B	C	D
Workers	1	44	38	47	36
	2	46	40	52	43
	3	34	36	44	32
	4	43	38	46	33
	5	38	42	49	39

Test whether the 5 men differ with respect to mean productivity and test whether the mean productivity is the same for the four different machine types.

| b) | The following data give the average life in hours and range in hours of 12 samples each of 5 lamps. Construct the control charts for $\overline{X}$ and R and comment on the state of control. | 8 | CO6 | [K₄] |

| $\overline{X}$ | 120 | 127 | 152 | 157 | 160 | 134 | 137 | 123 | 140 | 144 | 120 | 127 |
| R | 30 | 44 | 60 | 34 | 38 | 35 | 45 | 62 | 39 | 50 | 35 | 41 |

| 16. | a) | Two researchers adopted different sampling techniques while investigating the same group of students to find the number of students falling into different intelligence level. The results are as follows: | 8 | CO4 | [K₄] |

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?

| b) | The prices of two commodities over 10 weeks are given below. Find out which price shows less variation. | 8 | CO1 | [K₃] |

| A: | 54 | 55 | 53 | 56 | 52 | 52 | 58 | 49 | 50 | 51 |
| B: | 108 | 107 | 105 | 106 | 105 | 103 | 102 | 104 | 104 | 101 |

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