Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER – I EXAMINATION – SUMMER 2017

Subject Code: 2712507 Date:08/05/2017

Subject Name: STATISTICAL TECHNIQUES AND DESIGN OF EXPERIMENT

Time:02:30 p.m. to 05:00 p.m. Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 A textile mill has large number of output giving looms. It is expected that each loom gives same output and to verify this, an engineer collected following data of output (in meters) for three shifts from three different looms with four different operators. Two way Anova with more than one observation per cell. (With repetition) **14**

	Operator				
		A	B	C	D
Loom	I	57,65,59	55,54,60	67,60,58	60,66,54
	II	49,55,60	52,48,50	68,65,62	62,60,66
	III	54,64,58	46,50,48	58,60,62	65,60,62

Analyze the above data and write conclusions.

[F Table value for 2, 24 degree of freedom at 5% level = 3.40]

[F Table value for 3, 24degree of freedom at 5% level = 3.01]

[F Table value for 6, 24degree of freedom at 5% level = 2.51]

Q.2 **(a)** Define the following term. **07**

(1) Median (2) Correlation (3) Positive correlation (4) Linear correlation (5) Class Interval (6) Assignable cause (7) Chance cause

(b) Following are the marks obtained by ten different students in the subject of Physics and the subject of science. **07**

Student no	1	2	3	4	5	6	7	8	9	10
Marks in physics	68	64	75	50	64	80	75	40	55	64
Marks in science	62	58	68	45	81	60	68	48	50	70

Calculate spearman's rank correlation coefficient using the above data.

OR

(b) Explain poisson probability distribution with their properties. **07**

Q.3 A 2^2 factorial experiment was conducted to study the effect of the speed of the ring frame (A) and the traveler weight (B) on the hairiness index of the yarn. The experiment was carried out by spinning the yarns of three different counts on the same R/F. The results of hairiness indices obtained from the sample are as follow. **14**

20^S	40^S	60^S
(b) 7.8	(ab) 10.0	(1) 6.5
(1) 6.2	(a) 8.5	(ab) 9.5
(ab) 10.2	(b) 7.5	(b) 7.0
(a) 8.2	(1) 6.8	(a) 8.2

Carry out the analysis of the above data and write the conclusion.

[F Table value for 1, 6 degree of freedom at 5% level = 5.99]

[F Table value for 2, 6 degree of freedom at 5% level = 5.14]

OR

Q.3 (a) 10 ring bobbin selected from the production of the day shift & 15 ring bobbin selected from the production of the night shift have shown following result. From these sample result, is there any evidence that the yarn spun during night shift is coarser than the day shift? Use 10% los. **07**

	Day shift	Night shift
No of tests	10	15
Average count	40.2	39.3
S.D.of count	2.5	3.8

T table value at 23, 0.1 = 1.319

(b) An unbiased coin is tossed for 6 times. Find the probability of getting (i) 5 heads (ii) 3 heads (iii) at the most 3 heads. **07**

Q.4 (a) An experiment was carried out to study the effects of the speed of the ring frame on the number of end breakages and following results were obtained by taking five reading at each speed. (One way ANOVA) **07**

	Speed (rpm)			
	15000	16000	17000	18000
End breakages	18	22	23	30
	20	20	23	32
	18	21	25	28
	15	18	24	28
	17	23	23	35

Carry out analysis of the above data and write the conclusion.
[Table value of F for 3, 16 degree of freedom at 5% level = 3.24]

(b) Find out Q_1, Q_3, D9 & P_{35} for the following frequency distribution. **07**

Class	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Frequency	3	5	12	18	14	6	2

OR

Q.4 (a) Samples of five ring bobbin each selected from a ring frame for eight shifts have shown following results of count of yarn. **07**

Sample no	1	2	3	4	5	6	7	8
Count of yarn	27.5	27.4	25.4	28.5	28.5	28.9	28.0	28.4
	28.5	26.9	26.9	28.0	29.0	29.5	28.5	28.5
	28.0	26.0	28.0	29.2	28.5	30.0	27.8	28.4
	26.9	28.7	26.7	29.0	28.5	29.4	28.0	28.0
	28.6	29.0	28.2	28.7	28.0	28.9	28.1	28.7

Draw X bar and R chart for the above and write conclusion about the state of the process. (Table value : A2 = 0.577, D3=0, D4 =2.12)

(b) Explain Normal probability distribution with their properties. **07**

Q.5 (a) Find the equation of line of regression (X on Y & Y on X) to estimate number of garment sold using following data of price of garment (in Rs.) and number of garment sold. Also find number of garment sold if the price of garment is 112. **07**

Price of garment	100	105	110	115	120	125	130
Number of garment sold	85	80	70	75	65	60	60

(b) Following are the results of the fabric strength (in 10 gm) obtained from the sample of two different fabrics. **07**

Fabric A	22.0	21.5	22.8	21.0	23.0	20.9	21.6	22.0	22.8	21.2
Fabric B	22.3	21.6	22.0	22.1	22.0	22.3	21.8	21.8	21.6	21.8

Calculate CV% for both fabrics and state which fabric is more consistent in terms of strength?

OR

Q.5 **(a)** (i) State the difference between variable charts and attribute chart. **08**
(ii) What is factorial experiment?
(iii) Write down basic principle of ANOVA.
(iv) What is randomization & replication?

(b) A die is thrown 132 times with the following results. **06**

No. turned up	1	2	3	4	5	6
Frequency	16	20	25	14	29	28

Test the hypothesis die is unbiased. Apply X^2 test for goodness. (d.f. at 5% level = 11.07)

****