Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–I(New course)• EXAMINATION – WINTER- 2015

Subject Code: 2712507 **Date: 31/12/2015**

Subject Name: Statistical Techniques & Design of Experiment

Time:2:30 pm to 5:00 pm **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 2^2 factorial experiment was conducted to study the effect of the ring diameter (a) & the traveler weight (b) on hairiness index of the yarn. The experiment was carried out by spinning the yarn on three different ring frames. The results of hairiness indices obtained from the samples are as follows: **14**

RF I		RF II		RF III	
(b)	4.8	(ab)	8.0	(1)	6.5
(1)	6.2	(a)	5.5	(ab)	6.5
(ab)	7.2	(b)	7.5	(b)	7.0
(a)	5.2	(1)	6.8	(a)	5.2

Carry out the analysis of the above data and write the conclusion.
F table value for 0.05 d.f 1& 6 = 5.99, & 2, 6 = 5.14

Q.2 **(a)** (i) What is factorial experiment? **07**

(ii) State different types of control charts used in textile. Give at least one example of each from textile.

(iii) What are the basic principles of experimental design?

(b) Following is the ANOVA table for randomized block design. Complete the table and write conclusions. **07**

Source	d.f.	s.s.	m.s.s.	F ratio
Treatment	4		12.56	
Blocks	3			
Error	12	42.50		
Total	19	440.65		

F table value for 0.05 d.f 4 & 12 = 3.26, & 3, 12 = 3.49

OR

(b) A set of travelers were subjected to inspection. A set consists of 5 travelers and there are 20 subgroups. The inspection data obtained is as follows: **07**

Group No.	1	2	3	4	5	6	7	8
No. of defects	70	67	72	91	45	61	49	65
Group No.	9	10	11	12	13	14	15	16
No. of defects	45	77	59	57	41	87	40	22
Group No.	17	18	19	20				
No. of defects	92	89	55	35				

Draw the control chart for number of defects/unit ('c' chart) and write conclusions.

Q.3 **(a)** Following data represents the production of 30s cone by 3 workers on three different machines. **07**

	Machines		
Workers	A	B	C
x	16	64	40
y	56	72	64
z	12	56	28

Test whether mean productivity is same for different machine types. Also test whether 3 workers differ with respect to mean productivity.

F tab 0.05 with 2 & 4 d.f. =6.94

F tab 0.01 with 2 & 4 d.f. =18.0

(b) Following data are related to the percentage humidity and the warp breakage rate recorded per week in a loom shed. **07**

% Humidity	54	85	86	50	42	75	65	56
Warp breakage rate	2.45	1.21	1.20	2.84	3.25	1.86	1.90	2.32

Find Karl Pearson's coefficient of correlation using above data and comment on it.

OR

Q.3 **(a)** Compare different types of coefficient of correlation with Karl Pearson's coefficient of correlation. State the properties of Karl Pearson's coefficient of correlation. **07**

(b) An old type of scutcher has piano feed regulatory motion with cone drums. Find coefficient of correlation between diameter of top and bottom cone from following data. **07**

Top cone	89	86	74	65	65	63	66	67	72	79
Bottom Cone	82	91.5	84	75	73.5	72	70.5	75	77.5	84

Q.4 **(a)** Following data shows the effect of change in value of parameter x on parameter y. Find regression equation for the same. **07**

x	0	3	5	6	8	11
y	1	2	6	7	8	12

(b) (i) State advantages of acceptance sampling **07**

(ii) Write short note on normal distribution

OR

Q.4 **(a)** A 4x4 latin square design for data of lea strength for 4 types of spindle sets for 4 days is given below. **07**

	Spindle sets			
Days	1	2	3	4
1	(A) 46.2	(B) 42.8	(C) 43.4	(D) 43.0
2	(D) 43.2	(A) 47.0	(B) 41.8	(C) 42.5
3	(C) 44.0	(D) 42.0	(A) 46.5	(B) 42.0
4	(B) 43.0	(C) 42.5	(D) 41.6	(A) 44.5

Conduct ANOVA and offer your conclusions.

Ftab value for 0.05 at 3,6 d.f. is 4.76

Ftab value for 0.01 at 3,6 d.f. is 9.78

(b) The following data are related to number of defective garments produced by a group of workers in industry. Find the quartile deviation. **07**

No. of defective garments	x	28	32	40	50	58	62
No. of days	f	5	10	12	20	10	3

Q.5 **(a)** Count test on a certain yarn gave a mean of 39.84 and CV% 5.12. Calculate the proportion of count value below 36.50. **07**

Table value for 1.64 SD is 0.9495

(b) Five knitted garments were selected randomly at eight different times **07**

during the production & following results of no. of defective garments were obtained. Draw the Np and p charts and offer your comments.

Sample No.	1	2	3	4	5	6	7	8
No. of defective garments	0	2	1	1	2	0	0	0

OR

Q.5 **(a)** State the properties of regression equation. Give the final equation of line of regression of x on y and y on x. **07**

(b) Calculate mean, SD, variance and CV % from following data. **07**

Defects/100 m(x)	0	1	2	3	4
Frequency (f)	30	44	18	6	2

****