

O. C.

**G 6033**

M.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

First Semester

Apparel Technology and Management

AT 1602 — STATISTICAL APPLICATION IN TEXTILE ENGINEERING

(Common to TT 1602 Statistical Application in Textile Engineering for  
M.Tech. Textile Technology)

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

(Statistical Tables may be provided)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the conditions that must be satisfied to apply the Poisson probability distribution?
2. When is an estimator unbiased?
3. What is meant by Type I and Type II errors?
4. What is chi-square test of significance?
5. What is the purpose of analysis of variance?
6. What is the difference between one way and two-way classification?
7. What do you understand by 'interactive effect' between parameters on the response?  
What is a composite design?
8. Why is the replication essential while designing an experiment?
9. What is 'characteristic smallest value'?

PART B — (5 × 16 = 80 marks)

11. (a) What are two-parameter and three-parameter Weibull distributions? Explain the application of Weibull distribution in extreme value modeling. (4 + 12)

Or

- (b) What are initial and extreme value distributions? Explain the relation between them. How do you predict the performance of a certain lot of yarn in weaving by using extreme value distribution? (4 + 2 + 10)

12. (a) (i) What is standard normal distribution?  
(ii) A wearing trail was carried out to estimate the average life of a garment. 200 people were each issued with a garment and asked to wear it for 8hrs/day and 6 days a week. At the end of 4 weeks, 5 wearers reported that their garments were worn out and after 5 weeks a further 20 wearers conceded their garments were finished. Assuming the lives of the garments are normally distributed, estimate the mean and standard deviation of life of the garment and estimate the proportion of garments having life more than 60 hrs and 250 hrs. (2 + 14)

Or

- (b) (i) What are parameters of binomial distribution and what do they mean?  
(ii) A company makes sweater and claims that 98 % of the sweaters will pass a standard test. 100 sweaters are chosen at random from the production line.  
Assuming the company claiming is correct, find  
(1) the probability that more than 3 sweaters will fail the test.  
(2) the probability that 5 or more sweater will fail the test. (4 + 12)

13. (a) (i) Explain the concept of hypothesis testing.  
(ii) The following are the results of extension tests carried out on two types of sewing threads (percentage extension at break).

Sewing thread A : 14.1 14.7 15.1 14.3 15.6 14.8 13.9 14.4

Sewing thread B : 16.9 16.3 15.9 15.7 15.6 16.2 16.4 15.8

Do these results suggest that one sewing thread is significantly more extensible than the other? (6 + 10)

Or

- (b) (i) What is tests of significance and level of significance?  
(ii) To estimate the linear density of a delivery of yarn, ten standard tests were carried out, with the following results (tex):

20.2 21.3 20.6 20.1 21.3 20.4 21.4 20.0 21.1 20.8

Calculate 95% confidence limit for the true mean linear density.  
If it were required to estimate the mean linear density to within 0.2 tex, how many tests would be needed? (4 + 12)

4. (a) To investigate the effect of spindle speed and traveler weight on yarn hairiness, a study was carried out and the results are given below.

		Spindle speed (rpm)		
		14,000	16,000	18,000
Traveller number	1	5.2	5.4	5.7
	2	4.9	5.2	5.5
	3	4.7	5.1	5.4
	4	4.6	4.9	5.3

Find out whether the spindle speed and traveller weight have got an effect on yarn hairiness. Use 5% level of significance. (16)

Or

- (b) How is the variance caused by random error, treatment effect, block effect and interactive effect estimated separately in two-factor analysis of variance? (16)

6. (a) Construct a Taghuchi experimental design to investigate the effect temperature of the bath, time of treatment and concentration of enzyme on amount of weight loss of fabric. (16)

Or

- (b) Write short notes on the following :  
(i) Adequacy test for the regression equation  
(ii) The interpretation of full and fractional factorial design  
(iii) Orthogonal and rotatable designs. (16)