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B.Tech.(Textile) (2011 Onwards) (Sem.–6)

STATISTICAL METHODS & QUALITY CONTROL IN TEXTILES

Subject Code : BTTE-604

Paper ID : [A2763]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Define Quality Function Deployment and Quality Cost.

b) What do you understand by revised ISO 9000 series standard?

c) Find out minimum sample size for normal approximation to the binomial if $p = 0.32$.

d) Find out number of test required to give mean strength to an accuracy of 2% at the 95% confidence level. Given mean strength of yarn 700 gf with standard deviation of 42 gf.

e) Exhibit the nature of F distribution curve. Using statistical table find out $F_{0.95}(10, 20)$.

f) The mean and variance of a random variable X having binomial distribution are 4 and 2 respectively, then find out P ($x = 1$).

g) The mean and SD of a sample of size 10 were found to be 9.5 and 2.5 respectively. Later on, an additional observation 15 was added to the original data. Find out SD of 11 observations.

h) From a population if V_A is the standard deviation of 100 data of 100, 101, 102 .... and V_B is the standard deviation of 100 data of 150, 151, 152 ... from another population; then find out the ratio of the variance.

i) Define AQL, AOQL and LTPD in relation to OC curve.

j) The number of neps in a carded web follows Poisson distribution with a mean of 100 per m^2. Find out the probability that there is no nep in an area of 645 cm^2.

SECTION-B

2. Mean breaking strength of a particular brand of thread is 972 gf with a standard deviation of 14 gf. Recently a sample of 36 pieces of thread showed a mean breaking strength of 893 gf with standard deviation of sample 18 gf. Can one infer the thread has become inferior in respect with mean strength and variability?

3. The following are the results of extension tests carried out on two types of yarn (percentage extension at break) :

   Yarn 1: 14.1, 14.7, 15.1 14.3, 15.6, 14.8.

   Yarn 2: 16.9, 16.3, 15.9, 15.7, 15.7.

   Do these results suggest that one yarn is significantly more extensible than the other?

4. Two yarn samples consisting of 21 and 9 observations have variance given by S_1^2 =16 and S_2^2 = 10 respectively. Test whether population variance in first case is or not? Also comments about the conclusion if two sample consist of 120 observations each.

5. From the blend analysis at three different places of yarn, the following result was obtained.

	Section I	Section II	Section III
Polyester/Cotton	67:33	64:34	70:30

   Did the proportion differ significantly from the nominal value of 65: 35?

6. A process is controlled with a fraction non-conforming control chart with three sigma limits, n = 100, UCL = 0.161, centre line = 0.080, and LCL = 0. Find the equivalent control chart for the number non-conforming.

SECTION-C

7. a) The number of thin places in 1000 m of similar yarn spun on four different spinning machines were counted with the following results,

Machine number	1	2	3	4
Number of thin places	51	32	47	38

   Do these data suggest that there were significant differences among the machines?

   b) A textile mills wishes to establish a control procedure on flaws in towels. Using an inspection unit of 50 units, past inspection data show that 100 previous inspection

units had 850 total flaws. What type of control chart is appropriate? Design the control chart of $\alpha = 0.05$ such that it has two sided control limits.

8. a) Number of warp breaks on five different weaving machines was investigated over a span of time.

Breakage Zone	Machine number				
	1	2	3	4	5
A	14	14	10	12	8
B	7	3	8	5	12
C	6	19	20	9	2

Whether the pattern of stoppages is same for all marines? What more inference can be drawn from the above dataset?

b) Two judges ranked seven fabrics and the results are presented below.

Fabric	A	B	C	D	E	F	G
Judge 1	7	3	1	5	2	4	6
Judge 2	7	2	1	6	4	3	5

Do the above results suggest that opinion of the judges are matching? If so then what will be the final ranking?

9. The following table shows the nep level (per 1000 m) in the yarn produced from 3 spinning machine line using three different raw material.

Spg. m/c / **Raw Material**	1	2	3
A	40	55	35
	30	60	30
B	35	51	31
	38	57	38
C	32	62	30
	49	68	36

Interpret the results using ANOVA.