Roll No. ☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 03

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B.Tech.(Textile Engg.) (2011 Onwards)   (Sem.–6)
STATISTICAL METHODS & QUALITY CONTROL IN TEXTILES
Subject Code : BTTE-604
M.Code : 71738

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 of 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 the 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. On average, 0.15% of the garment manufactured at a factory is known to be defective. If a random sample of 400 garments is inspected, what is the probability of there being no more than 3 defective garments?

3. A company makes a raincoat and claims that 95% of its coats will pass a standard water proof test. 50 coats are chosen at random from the production line. Assuming that the firms claim is correct find

    a) The average no of coats that would be expected to fail?

    b) The probability that more than two coat will fail the test?

4. Pieces of five different fabrics were divided into two parts and each part was given one of two shrink resist treatments. Tests for percentage area shrinkage were carried out with the following results.

Fabric	a	b	c	d	e
Treatment A	4	5	3	10	6
Treatment B	4	6	6	8	8

    Was any treatment significantly different from other?

5. 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 suggests that one yarn is significantly more extensible than the other?

6. In a manufacturing process, sample of size n = 5 are taken for quality check at every hour. After 25 samples have been analyzed, we have

    $$\sum_{i=1}^{25} \bar{x}_i = 662.50 \text{ and } \sum_{i=1}^{25} R_i = 9.00$$

    The quality characteristics are normally distributed.

    a) Find the control limits for $\bar{x}$ and R chart.

    b) Assuming both the charts exhibits control, estimate the fraction nonconforming if the specifications are 26.4 ± 0.50.

SECTION-C

7. The following table shows the nep level (per 1000 m) in the yarn produced from 3 spinning machine line using three different raw material. (10)

Raw Material	Spinning m/c		
	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.

8. a) Number of warp breaks on five different weaving machines was investigated over a span of time. (5)

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 machines? What more inference can be drawn from the above dataset?

b) Handle and comfort rankings of seven fabrics are presented below : (5)

Fabric	A	B	C	D	E	F	G
Handle rank	7	3	1	5	2	4	6
Comfort rank	7	2	1	6	4	3	5

Do the above results suggest that handle and comfort are closely related?

9. The data below relate the thickness loss during calendaring of a viscose needle-punched fabric and the load on the calendar bowl.

Load (tons)	0.5	1.0	1.5	2.0	2.5	3.0
Thickness loss (%)	4	13	14	20	24	33

Find out :

a) If there is any linear relationship among the two variables. (3)

b) The strength of relationship in terms of 'r' and F value due to regression. (2)

c) Standard error of the regression equation. (3)

d) Find out range of thickness loss data for a load value of 2.3 tons. (2)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.