



Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech (MTT)/SEM-2/MTT-206/2010

2010

STATISTICAL QUALITY CONTROL

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. $5 \times 14 = 70$

1. a) A product is assembled from three components X, Y & Z, the probability of these components being defective is respectively 0.01, 0.02 & 0.05. What is the probability that the assembled product will not be defective ?

- b) Is the following a probability density function ?

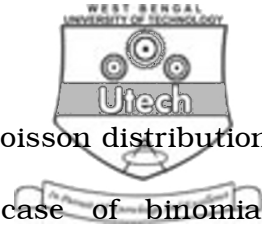
$$f(x) = \begin{cases} 2x, & 0 < x \leq 1 \\ 4 - 2x, & 1 < x \leq 2 \\ 0, & \text{elsewhere} \end{cases}$$

- c) If the random variable X has the probability density function

$$f(x) = \begin{cases} \frac{1}{4} & -2 \leq x \leq 2 \\ 0 & \text{elsewhere} \end{cases}$$

obtain $p\{(2x+3) > 5\}$. Here p denotes probability.

5 + 5 + 4



2. a) Explain the conditions under which Poisson distribution may be obtained as a limiting case of binomial distribution.

b) Explain clearly the concept of sampling distribution of a statistic.

c) Show that the mean and standard error of sample mean (\bar{x}) from simple samples of size 'n' are

$$E(\bar{x}) = \mu \text{ \& \; } S.E(\bar{x}) = \frac{\sigma}{\sqrt{n}} \quad 5 + 4 + 5$$

3. a) The mean of a certain normal distribution is equal to the standard error of the mean of samples of 25 from the distribution. Find the probability that the mean of a sample of 49 from the distribution will be negative.

(Given :- Area under standard normal curve to the left of the ordinate at 1.4 is 0.9192).

b) Explain briefly the two terms – standard deviation & standard error.

c) Describe the important characteristics of 't' & F distributions.

6 + 4 + 4



4. a) Distinguish between point estimation & interval estimation.
- b) A random sample of 100 ball bearings selected from a shipment of 2000 ball bearings has an average diameter of 0.354 inch with a S.D. = 0.048 inch. Find 95% confidence interval for the average diameter of these 2000 ball bearings.
- c) A machine produced 20 defective articles in a batch of 400. After overhauling it produced 10 defectives in a batch of 300. Has the machine improved ? 4 + 6 + 4
5. a) Distinguish between process control & product control.
- b) Explain the theoretical background of a control chart and also explain the construction of P-chart & C-chart.
- c) Describe how you construct a \bar{X} chart and explain its uses. 3 + 7 + 4
6. a) Explain the logic of setting the control limits at $\sigma \pm 3$.
- b) A drilling machine bores holes with a mean diameter of 0.5230 cm and S.D. of 0.0032 cm. Calculate the 2 sigma and 3 sigma upper and lower control limits for means of samples 4, and prepare a control chart. 6 + 8
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