

II B.Tech I Semester(R07) Supplementary Examinations, May/June 2010

PROBABILITY AND STATISTICS

(Common to Computer Science & Engineering, Information Technology and Computer Science & Systems Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) State the three axioms of probability
(b) Prove that
 - i. $P(A^C) = 1 - P(A) \leq 1$
 - ii. $P(B) \leq P(A)$ when $B \subset A$. [6+10]
2. (a) Let the continuous random variable X have the probability density function,

$$f(x) = \begin{cases} 2/x^3, & \text{if } 1 < x < \infty \\ 0 & \text{other wise} \end{cases}$$
 Find F(x).
(b) Given that $f(x)=K/2x$, is a probability distribution for a random variable X that can take on the values $x = 0,1,2,3$ and 4.
 - i. Find K
 - ii. Mean and variance of X. [8+8]
3. Seven coins are tossed and the number of heads are noted. The experiment is repeated 128 times and the following distribution is obtained.

No. of heads	0	1	2	3	4	5	6	7	Total
Frequency	7	6	19	35	30	23	7	1	128

Fit a binomial distribution assuming,

- (a) the coin is unbiased
- (b) the nature of the coin is not known. [16]
4. It has been found that 2% of the tools produced by a certain machine are defective. What is the probability that in a shipment of 400 such tools
 - (a) 3% or more
 - (b) 2% or less will prove defective. [16]
5. (a) Give the difference between interval estimation and Bayesian estimation ?
(b) Give the difference between point estimation and Bayesian estimation ?
(c) Define
 - i. Estimate
 - ii. Estimator.
 - iii. Estimation. [4+4+8]
6. (a) The mean life time of a sample of 100 light tubes produced by a company is found to be 1560 hrs with a population S.D of 90 hrs. Test the hypothesis that the mean life time of the tubes produced by the company is 1580 hrs.
(b) Explain the procedure generally followed in testing of hypothesis? [10+6]
7. (a) Write the formula for paired t - test for difference of means

- (b) Ten workers were given a training programme with a view to study their assembly time for a certain mechanism. The results of the time and motion studies before and after the training programme are given below.

Workers	1	2	3	4	5	6	7	8	9	10
X1	15	18	20	17	16	14	21	19	13	22
Y1	14	16	21	10	15	18	17	16	14	20

X1 = Time taken for assembling before training

Y1 = Time taken for assembling after training.

Test whether there is significant difference in assembly times before and after training. [2+14]

8. A department store in a city maintains a successful catalog sales department in which a clerk takes orders by telephone. If the clerk is occupied on one line, incoming phone calls to the catalog department are answered automatically by a recording machine and asked to wait. As soon as the clerk is free, the party that has waited the longest is transferred and answered first. Calls come in at a rate of about 10 per hour. The clerk is capable of taking an order in an average of 4 minutes. Calls tend to follow a Poisson distribution, and service times tend to be exponential. The clerk is paid Rs. 10 per hour, but because of lost good will and sales, store loses about Rs. 52 per hour of customer time spent waiting for the clerk to take an order.
- (a) What is the average time that a customer must wait before their calls are transferred to the order clerk?
- (b) Store manager is considering a professionally trained clerk to receive the calls. The store would pay Rs. 15 for the new clerk, who is capable of taking an order in an average of 2.5 minutes. Should the store hire a professionally trained clerk or not? [8+8]
