Code No: NR220105 **NR**

II B.Tech II Semester Supplementary Examinations, April/May 2005
PROBABILITY AND STATISTICS
(Common to Civil Engineering, Computer Science & Engineering, Chemical Engineering, Information Technology, Computer Science & Systems Engineering, Electronics & Computer Engineering and Production Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define finite equi-probable space.
   (b) Two cards are selected at random from 10 cards numbered 1 to 10. Find the probability p that the sum is odd if
      i. The two cards are drawn together.
      ii. The two cards are drawn one after the other without replacement
      iii. The two cards are drawn are after the other with replacement.

2. (a) In 100 sets of ten tosses of an unbiased coin, in how many cases should we expect
      i. Seven heads and three tails
      ii. At least seven heads?
   (b) An office switch board receives telephone calls at the rate of 3 calls per minute on an average. What is the probability of receiving
      i. No calls in a one minute interval
      ii. At most 3 calls In a 5 minutes interval?

3. (a) The diameter of an electric cable is assumed to be a continuous random variable X with pdf f(x) = 6x(1-x); $0 \leq X \leq 1$,
      i. Check whether f(x) is really a pdf
      ii. Determine b such that P(X < b) = P(X > b).
   (b) X is a normal variable with mean 30 and S.D 5. Find the probability that
      i. $26 \leq X \leq 40$
      ii. $X \geq 45$ and
      iii. $|X - 30| > 5$.

4. (a) A random sample of size 25 from a normal population has the mean $\overline{x}$=47.5 and the standard deviation s=8.4. Does this information support or refute the claim that the mean of the population is μ =42.1?
   (b) A manufacturer of electric bulbs claims that the percentage of defectives in his product does not exceed 6. A sample of 20 bulbs is found to contain 5 defectives. Would you consider the claim justified.

5. (a) In a batch chemical process, two catalysts are being compared for their effect on the output of the process reaction. A sample of 12 batches was prepared using catalyst 1 and a sample of 10 batches was obtained using catalyst 2. The 12 batches for which catalyst 1 was used gave an average yield of 85 with a sample standard deviation of 4, and the second sample gave an average of 81 and a sample standard deviation of 5. Find a 90% confidence interval for the difference between the population means, assuming that the populations are approximately normally distributed with equal variances.

   (b) A coin is tossed 10,000 times and it turns up head 5195 times. Discuss whether the coin may be regarded as unbiased one?

6. (a) It is desired to test the hypothesis $\mu_0 = 40$ against the alternative hypothesis $\mu_1 = 42$ on the basis of a random sample from a normal population with the standard deviation $\sigma = 4$. If the probability of a Type 1 error is to be 0.05 and the probability of a Type II error is to be 0.24, find the required size of the sample.

   (b) The diameter of rotor shafts in a lot has a mean of 0.249 inch and a standard deviation of 0.003 inch. The inner diameters of bearings in another lot have a mean of 0.255 inch and a standard deviation of 0.002 inch. (i) What are the mean and the standard deviation of the clearances between shafts and bearings selected from these lots? (ii) If a shaft and a bearing are selected at random, what is the probability that the shaft will not fit inside the bearing? (Assume that both dimensions are normally distributed)

7. (a) Fit a least square straight line to the following data

x	2	7	9	1	5	12
y	13	21	23	14	15	21

   (b) Fit a least square quadratic curve to the following data

x	1	2	3	4
y	1.7	1.8	2.3	3.2

8. (a) Construct a 95% confidence internal for the population correlation coefficient e given r=0.70 and n= 30.

   (b) AT 0.05 level of significance, test the null hypotheris e= 0.9 against the alternative e $>$ 0.9 for n = 29, r = 0.9435.

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