Code No: 07A3BS03 **Set No. 1**

II B.Tech I Semester Regular Examinations, November 2008
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

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1. (a) Two marbles are drawn in succession from a box containing10 red, 30 white, 20 blue and 15 orange marbles, with replacement being made after each drawing. Find the probability that
   i. both are white
   ii. first is red and second is white
   (b) a businessman goes to hotels X, Y, Z ; 20% , 50% , 30% of the time respectively. It is known that 5% , 4%, 8% of the rooms in X, Y, Z hotels have faulty plumbing. What is the probability that businessmans room having faulty plumbing is assigned to hotel Z. [8+8]

2. (a) If probability density function
   $f(x) = kx^3$ in $\leq \times \leq 3$
   $= 0$ elsewhere
   Find the value of K and find the probability between x=1/2 and x=3/2.
   (b) A random variable X has the following probability distribution.

X:	1	2	3	4	5	6	7	8
f(x):	K	2K	3K	4K	5K	6K	7K	8K

   Find the value of
   i. K
   ii. P(x $\leq$ 2)
   iii. P(2$\leq$ x $\leq$5). [8+8]

3. (a) Using recurrence formula find the probabilities when x=0,1,2,3,4 and 5; if the mean of Poisson distribution is 3.
   (b) If the masses of 300 students are normally distributed with mean 68Kgs and standard deviation3 Kgs. How many students have masses.
   i. Greater than 72 Kg
   ii. Less than or equal to 64 Kg
   iii. Between 65 and 71 Kg inclusive. [8+8]

4. Samples of size 2 are taken from the population 1, 2, 3, 4, 5, 6 with replacement. Find
   (a) The mean of the population

(b) Standard deviation of the population

(c) The mean of the sampling distribution of means

(d) The standard deviation of the sampling distribution of means. [16]

5. (a) A random sample of 400 items is found to have mean 82 and S.D of 18. Find the maximum error of estimation at 95% confidence interval?

   (b) Measurements of the weights of a random sample of 200 ball bearing made by a certain machine during one week showed a mean of 0.824 and a standard deviation of 0.042. Find maximum error at 95% confidence interval? [8+8]

6. (a) Write the formula for testing the hypothesis concerning "Two Means".

   (b) The research investigator was interested in studying whether there is a significant difference in the salaries of MBA grades in two metropolitan cities. A random sample size 100 from Mumbai yields on average income of Rs.20,150. Another random sample of 60 from Chennai results in an average income of Rs.20,250. If the variances of both the populations are given as σ_1^2 = Rs.40,000 and σ_2^2= Rs.32,400 respectively. [4+12]

7. The three samples below have been obtained from normal populations with equal variances.
   Test the Hypothesis that the sample means are equal.

11	10	15
13	8	12
9	13	15
18	13	16
14	10	18

   The table value of F at 5% LOS for V1 = 2 and V2 = 12 is 3.88. [16]

8. A manager of a local hamburger restaurant is preparing to open a new fast food restaurant called Hasty Burgers. Based on the arrival rates at existing outlests. Manager expects customers to arrive at the drive in window according to a Poisson distribution, with a mean of 20 customers per hour. The service rate is flexible, however, the service times are expected to follow an exponential distribution. The drive in window is single ever operation.

   (a) What service rate is needed to keep the average number of customers in the service system to 4

   (b) For the service rate in part (a), what is he probability that more than 4 customers are in the line and being served? [8+8]

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Code No: 07A3BS03 **Set No. 2**

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Answer any FIVE Questions
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1. (a) For any three arbitrary events A, B, C, prove that
P(A∪B ∪ C) = P (A) + P(B) + P (C) - P (A ∩ B) - P (B ∩ C) - P (C ∩ A) + P(A ∩B ∩ C)
(b) State and prove Baye's theorem. [8+8]

2. Find
(a) The constant K such that
$f(x) = Kx^2, \quad if\ 0 < x < 3$
$= 0, \quad otherwise$
is a probability function
i. Find the distribution function F(x)
ii. P(1<X ≤ 2)
(b) If the probability density function of X is given by
$f(x) = x/2 \quad for \quad 0 < x \leq 1$
$= 1/2, \quad for \quad 1 < x <\leq 2$
$= (3-x)/2 \quad for \quad 2 < x < 3$
$= 0 \quad elsewhere$
Find the expected value of f(x)= x^2 - 5x+3 [8+8]

3. (a) Out of 800 families with 5 children each, how many would you expect to have
i. 3 boys
ii. Either 2 or 3 boys
(b) Average number of accidents on any day on a notional highway is 1.6 Determine the probability that the number of accidents are
i. at least one
ii. at most one. [8+8]

4. A random sample of 10 boys had the following IQ's 70, 120, 110, 101, 88, 83, 95, 98, 107, 100.
(a) Do these data support the assumptions of a population mean IQ of 100?
(b) Find a reasonable range in which most of the mean IQ values of samples of 10 boys lie. [8+8]

5. (a) A random sample of 400 items is found to have mean 82 and S.D of 18. Find the maximum error of estimation at 95% confidence interval. Find the confidence limits for the mean if x = 82?

   (b) Measurements of the weights of a random sample of 200 ball bearing made by a certain machine during one week showed a mean of 0.824 and a standard deviation of 0.042. Find maximum error at 95% confidence interval. Find the confidence limits for the mean if x = 32? [8+8]

6. (a) Explain the procedure generally followed in testing of hypothesis

   (b) Write short note on Type I and Type II Error. [8+8]

7. The life time of electric bulbs for a random sample of 10 from a large consignment gave the following date.

Item :	1	2	3	4	5	6	7	8	9	10
Life in 000hrs :	1.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

   Can we accept the hypothesis that the average life time of bulbs is 4000 hrs. [16]

8. At a certain petrol pump, customers arrive in a Poisson process with an average time of five minutes between arrivals. The time intervals between serves at the petrol pump follows exponential distribution and the mean time taken to service a unit is two minutes. Find the following :

   (a) Average time a customer has to wait in the queue

   (b) By how much time the flow of the customers be increases to justify the opening of another service point, where the customer has to wait for five minutes for the service. [8+8]

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Code No: 07A3BS03 **Set No. 3**

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1. (a) State and prove Baye's theorem.
   (b) Out of 15 items 4 are not in good condition 4 are selected at random. Find the probability that
      i. All are not good
      ii. Two are not good. [8+8]

2. (a) If probability density function
   $f(x) = kx^3$ in $\leq \times \leq 3$
   $= 0$ elsewhere
   Find the value of K and find the probability between x=1/2 and x=3/2.
   (b) A random variable X has the following probability distribution.

X:	1	2	3	4	5	6	7	8
f(x):	K	2K	3K	4K	5K	6K	7K	8K

   Find the value of
      i. K
      ii. P(x $\leq$ 2)
      iii. P(2$\leq$ x $\leq$5). [8+8]

3. (a) Wireless sets are manufactured with 25 soldered joints each. On the average 1 joint in 500 is defective. How many sets can be expected to be from defective joints in a consignment of 10,000 sets.
   (b) The mean and variable of binomial distribution are 4 and 4/3 respectively. Find P(x $\geq$1). [8+8]

4. Let u_1= (3, 7, 8), u_2= (2, 4). Find
   (a) μ_{u1}
   (b) μ_{u2}
   (c) Mean of the sampling distribution of the differences of means μ_{u1-u2}
   (d) σ_{u1}
   (e) σ_{u2}
   (f) the standard deviation of the sampling distribution of the differences of means (σ_{u1-u2}) [16]

5. (a) The mean and standard deviation of a population are 11795 and 14054 respectively, what can one assert the 95% confidence about the maximum error if x = 11795 and n= 50. Find the confidence limits for the mean if x = 84?
   (b) Find 95% confidence limits for the mean of a normality distribution population form which the following sample was taken 15,17,10,18,16,9,7,11,13,14? [8+8]

6. (a) What is meant by Level of significance ?
   (b) Write the formula for testing the hypothesis concerning "Two Means"? [8+8]

7. 4 coins were tossed 160 times and the following results were obtained.

No. of Heads :	0	1	2	3	4
Observed Frequencies :	17	52	54	31	6

   Under the assumption that coins are balanced, find the expected frequencies of 0,1,2,3, or 4 heads, and test the goodness of fit ($\alpha = 0.05$). [16]

8. A fast-food restaurant has one drive-in window. It is estimated that cars arrive according to a Poisson distribution at the rte of 2 every 5 minutes and that there is enough space to accommodate a line of 10 cars. Other arriving cars can wait outside this space, if necessary. It takes 1.5 minutes on the average to fill an order, but the service time actually varies according to an exponential distribution. Determine the following.
   (a) The probability that the facility is idle
   (b) The expected number f customers waiting to be served. [8+8]

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Code No: 07A3BS03 **Set No. 4**

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1. (a) The probabilities of 3 students to solve a problem in Mathematics are 1/2, 1/3, 1/4 respectively, find the probability that the problem to be solved.
   (b) A, B, C are aiming to shoot a balloon. A will succeed 4 times out of 5 attempts. The chance of B to shoot the balloon is 3 out of 4 and that of C is 2 out of 3. If the three aim the balloon simultaneously, then find the probability that at least two of them hit the balloon. [8+8]

2. (a) Calculate the mean for the following distribution.

X=x :	0.3	0.2	0.1	0	1	2	3
P(X=x):	0.05	0.10	0.30	0	0.30	0.15	0.1

   (b) A discrete random variable X has the mean 6 and variance 2. If it is assumed that the distribution is binomial find the probability that $5 \leq x \leq 7$. [8+8]

3. (a) If the probability is 0.05 that a certain wide-flange column will fill under a given axial load. What are the probability that among 16 such columns
      i. at most two will fail
      ii. at least four will fail
   (b) If the chance that any of the 10 telephone lines is busy at an instant is 0.2. what is the most probable number of busy lines and what is the probability of this number. [8+8]

4. Determine the mean and standard deviation of sampling distributions of variances for the population 3, 7, 11, 15 with n=2 and the sampling is with replacement. [16]

5. (a) Define
      i. Estimate
      ii. Estimator
      iii. Estimation
   (b) Explain about "Point Estimation". [8+8]

6. A researcher wants to know the intelligence of students in a school. He selected two groups of students. In the first group there 150 students having mean IQ of 75 with a S.D of 15 in the second group there are 250 students having mean IQ of 70 with S.D of 20.

Test whether the groups have came from same population (Use α as 0.01)
IQ test on two groups of boys and girls gave the following results.
Mean of Girls = 78, S.D = 10, n= 30
Mean of Boys = 78, S.D = 13, n=70
Is there any significance in the mean score of girls and boys at 5% Level of significance? [16]

7. Eight students were given a test in STATISTICS and after one month coaching they were given another test of the similar nature. The following table gives the increase I their marks in the second test over the first.

Student No.	1	2	3	4	5	6	7	8
Increase of Marks	4	-2	6	-8	12	5	-7	2

Do the marks indicate that the students have gained from the coaching. [16]

8. (a) Explain about queing theory characteristics?
   (b) Define preemptive discipline and non preemptive priority? [12+4]

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