Code No: V0121 **R07** SET - 1

II B. Tech II Semester Supplementary Examinations Dec – 2012
PROBABILITY AND STATISTICS
(Com to CE, ME, CHEM, AME, MM)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Give: i) the classical definition of probability ii) Axiomatic approach of probability.
   b) An urn 'A' contains 8 black balls and 5 white balls. A second urn 'B' contains 6 black and 7 white balls. Find the probability that blind folded person in one draw shall obtain a white ball from an urn. (8M+8M)

2. a) If the probability density of a random variable is given by

$$f(X)=\begin{cases} x & for\ 0<x<1 \\ 2-x & for\ 1\le x<2 \\ 0, & else\ where \end{cases}$$

   Find the probabilities that a random variable having this probability density will take on a value i) between 0.2 and 0.8 ii) between 0.6 and 1.2.
   b) From a lot of 10 items containing 3 defectives, a sample of 4 items is drawn a random. Let the random variable x denote the number of defective items in the sample. Find the probability distribution of x when the sample is drawn without replacement. (8M+8M)

3. a) Determine Mean and Variance of Poisson distribution.
   b) In a normal distribution, 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution. (8M+8M)

4. a) A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that mean of a sample of size 900 will be negative.
   b) Construct S.D of means for the population 3, 7, 11, 15 by drawing samples of size two with replacement. Determine a) μ b) σ c) S. D. M (Standard Deviation of Mean) d) $\mu_{\bar{x}}$
   (8M+8M)
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5. a) Define: Unbiased estimator. Show that s^2 is an unbiased estimator of the parameter σ^2

   b) A sample of size 10 was taken from a population S.D of sample is 0.3. Find the maximum error with 99% confidence. (8M+8M)

6. a) In a random sample of 125 cola drinkers, 68 said they prefer Thumsup to Pepsi. Test the Num. Hypothesis P = 0.5 against the alternative hypothesis P>0.5.

   b) The mean and standard deviation of a population are 11795 and 14054 respectively. If n = 50. Find 95% confidence interval for the mean (8M+8M)

7. a) To compare two kinds of bomber guards 6 of each kind were mounted on a car and then the car was ran in to a concrete wall the following are the casts of repairs.

Guard 1	107	148	123	165	102	119
Guard 2	134	115	112	151	133	129

   Use the 0.01 level of significance to test whether the difference between two sample means is significant.

   b) The nicotine contents in milligrams in two samples of tobacco were found to be as follows:

Sample A	24	27	26	21	25	-
Sample B	27	30	28	31	22	36

   Can it be said that two samples came from normal population. (8M+8M)

8. a) Define : (i) Queue (ii) Service pattern (iii) Arrival pattern

   b) In (M/M/1) : $(\infty / FIFO)$system, prove that the average waiting time of a customer in a queue is $W_q = \frac{\rho}{\mu - \lambda}$ (8M+8M)

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1. a) Define: Random experiment, Equally likely events, Exhaustive events mutually likely events.

   b) The students in a class are selected at random are after the outer for an examination. Find the probability that the boys and girls sit alternately if there are i) 5 boys and 4 girls. ii) 4 boys and 4 girls. (8M+8M)

2. a) Find the mean and variance of the uniform probability distribution given by $f(x) = \frac{1}{n}$ for x = 1, 2, 3, …… n

   b) Let $f(x) = 3x^2$ when $0 \le X \le 1$ be the probability density function of a continuous random variable X. Determine 'a' and 'b' such that i) P (x≤a) = P (x>a) ii) P (x>b) = 0.05. (8M+8M)

3. a) Assume that 50% of all engineering students are good in Mathematics. Determine the probabilities that among 18 Engineering students. i) exactly 10 ii) at least 10 iii) at most 8 iv) atleast 2 and at most 9 are good in Mathematics.

   b) If X is a normal variate with mean 30 and standard deviation 5. Find the probabilities that i) $26 \le X \le 40$ ii) $X \ge 45$ (8M+8M)

4. a) A population consists of six members 4, 8, 12, 16, 20, 24 consider all samples of size two which can be drawn without replacement from this population. Find i) the population mean. ii) Population S.D iii) Mean of the sampling distribution of means.

   b) A random sample of size 100 is taken from an infinite population having the mean $\mu = 76$ and the variance $\sigma^2 = 256$. What is the probability that $\bar{x}$ will be between 75 and 78. (8M+8M)
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Code No: V0121 **R07** SET - 2

5. a) A random variable having the binomial distribution and get x successes in n trials. Show that $\frac{x}{n}$ is an unbiased estimate of the binomials parameter p.

   b) Find 95% confidence limits for the mean of a normally distributed population from which the following sample was taken 15, 17, 10, 18, 16, 9, 17, 11, 13, 14. (8M+8M)

6. a) Among 900 people in a state 90 are found to be Chapati eaters. Construct 99% confidence interval for the true proportion.

   b) The means of two large samples of sizes 1000 and 2000 members are 67.5 inches 68.0 inches respectively can the samples be regarded as drawn from the same population of S.D. 2.5 inches. (8M+8M)

7. a) A die is thrown 264 times with the following results. Show that the die is biased.

   [Given $X_{0.05}$ = 11.07 for 5 df].

No. appeared on the die	1	2	3	4	5	6
Frequency	40	32	28	58	54	60

   b) Define the statistics't' & 'F' and write down their sampling distributions. State the important assumptions in respect of them. (8M+8M)

8. a) Describe the characteristics of $(M|M|1)$: (N/FIFO) model.

   b) Prove that expected waiting time was = $\frac{\rho}{u-\lambda}$ (8M+8M)

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1. a) A card is drawn from a well shuffled pack of cards. What is the probability that it is either a spade or an ace?

   b) Define conditional probability. The probabilities that students A, B, C, D. Solve a problems are $\frac{1}{3}, \frac{2}{5}, \frac{1}{5}$ and $\frac{1}{4}$ respectively. If all of them try to solve the problem. What is the problem is solved? (8M+8M)

2. a) A random variable x has the following probability function

X	4	5	6	8
P(x)	0.1	0.3	0.4	0.2

   Determine: i) Expectation ii) Variance iii) Standard Deviation.

   b) For the continuous random variable x whose probability density function is given by:

   $f(x) = x^2$; $0 \le x \le 1$
   $= 0$; *elsewhere*

   If P($a \le x \le 1$) = $\frac{19}{81}$ find the value of a (8M+8M)

3. a) Determine Mean and Variance of Binomial distribution.

   b) Suppose 2% of the people on the average are left handed. Find:

   i) The probability of finding 3 or more left handed.

   ii) The probability of finding none or one left handed. (8M+8M)

4. a) Define: i) Sample ii) Sampling iii) Population iv) Sampling distribution & standard error

   b) The mean height of students in a college is 155 cms and standard deviation is 15. What is the probability that the mean height of 36 students is less than 157 cms? (8M+8M)
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5. a) A sample of 11 rats from a central population had an average blood viscosity of 3.92 with a S.D of 0.61. Estimate the 95% confidence limits for the mean blood is viscosity of the population.

   b) Determine 99 % confidence interval for the mean contents of soft drink bottles if contents of 7 such soft drink bottles are 10.2, 10.4, 9.8, 10.0, 9.8, 10.2, 9.6 ml. (8M+8M)

6. a) If 80 patients are treated with an antibiotic 59 got cured. Find a 99% confidence limits to the true population of cure.

   b) 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? (8M+8M)

7. a) A sample of 26 bulbs gives a mean life of 900 hours the manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not up to the standard?

   b) Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results:

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	-

   Test whether the two horses have the same running capacity. (8M+8M)

8. a) Write short notes on: $(M|M|1):(\infty|FIF0|)$ queuing system.

   b) Prove that the expected number of customers in the system $E(n) = L_s = \frac{\lambda}{\mu - \lambda}$ (8M+8M)

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1. a) Define Probability. A & B throw alternatively with a pair of ordinary dice. A wins if he throws 6 before B throws 7 and B wins if he throws 7 before A throws 6. If A begins show that his chance of winning is $\frac{30}{6}$

   b) State and Prove Baye's theorem. (8M+8M)

2. a) A random variable X has the following probability function:

x	-2	-1	0	1	2	3
P(x)	0.1	K	0.2	2k	0.3	k

   Find: i) k ii) Mean iii) Variance.

   b) If X is a continuous random variable and k is a constant then prove that:

   i) Var(x+k) = var (x) ii) Var (k x i = k^2 var(x). (8M+8M)

3. a) The mean and variance of a binomial variable x with parameters n and p are 16 and 8. Find p ($x \geq 1$) and p ($x>2$).

   b) If X is a normal variate, find the area A.

   i) To the left of z = - 1.78

   ii) To the right of z = - 1.45

   iii) Corresponding to $-0.8 \leq z \leq 1.53$

   iv) To the left of z = - 2.52 and to the right of z = 1.83 (8M+8M)

4. a) Calculate the size of S.D of means for the population 16, 14, 12, 8, 24, 20 by drawing samples of size 2 without replacement. Verify the results.

   b) A random sample of size 64 is taken from a normal population with $\mu = 51.4$ and $\sigma = 68$. What is the probability that the mean of sample will i) Exceed 52.9

   ii) Fall between 50.5 and 52.3. (8M+8M)
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5. a) What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with atleast 95% confidence.

   b) A sample of size 10 was taken from a population S.D of sample is 0.3. Find the maximum error with 99% confidence. (8M+8M)

6. a) A coin is tossed 900 times and heads appear 490 times. Does this result support the hypothesis that the coin is unbiased?

   b) In a random sample of 160 workers exposed to a certain amount of radiation, 24 experienced some ill effects. Construct a 99% confidence interval for the corresponding the percentage.

   (8M+8M)

7. a) Two independent samples of 7 items respectively had the following values.

Sample I	11	11	13	11	15	9	12	14
Sample II	9	11	10	13	9	8	10	-

   Is the difference between the means of samples significant?

   b) A pair of dice are thrown 360 times and the frequency of each sum is indicated below:

Sum	2	3	4	5	6	7	8	9	10	11	12
Frequency	8	24	35	37	44	65	51	42	26	14	14

   Would you say that the dice are fair on the basis of the chi-square test at 0.05 level of significance? (8M+8M)

8. a) Describe Queuing system.

   b) Prove that Average Queue length $L_q = \frac{\lambda^2}{\mu(\mu - \lambda)}$ (8M+8M)