

Code No: R22011

**R10**
**SET - 1**
**II B. Tech II Semester Regular Examinations August - 2014**
**PROBABILITY AND STATISTICS**

(Com. to CE, CHEM, PE)

Time: 3 hours

Max. Marks: 75

 Answer any **FIVE** Questions  
 All Questions carry **Equal** Marks  
 ~~~~~

1. a) Two marbles are drawn in succession from a box containing 10 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 businessman room having fault plumbing is assigned to hotel Z. (8M+7M)

2. Find:

a) The constant K such that

$$f(x) = \begin{cases} Kx^2, & \text{if } 0 < x < 3 \\ 0, & \text{otherwise} \end{cases} \quad \text{is a probability function}$$

- i) Find the distribution function F(x)      ii)  $P(1 < X \leq 2)$

b) If the probability density function of X is given by

$$f(x) = \begin{cases} \frac{x}{2} & \text{for } 0 < x \leq 1 \\ \frac{1}{2} & \text{for } 1 < x \leq 2 \\ \frac{(3-x)}{2} & \text{for } 2 < x \leq 3 \\ 0 & \text{else where} \end{cases}$$

 Find the expected value of  $f(x) = x^2 - 5x + 3$ .

(8M+7M)

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 free from defective joints in a consignment of 10000 sets?

 b) The mean and variance of binomial distribution are 4 and  $\frac{4}{3}$  respectively. Find  $P(x \geq 1)$ .

(8M+7M)

Code No: R22011

**R10**
**SET - 1**

4. Determine the mean and standard deviation of sampling distribution of variances for the population 3, 7, 11, 5 with  $n = 2$  and sampling is with replacement. (15M)
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.  
 b) Measurements of the weights of a random sample of 200 ball bearings made by a certain machine during one week showed a mean of 0.824 and a S.D. of 0.042. Find maximum error at 95% confidence and 90% confidence and 90% confidence interval. (7M+8M)
6. a) Explain the procedure generally followed in testing of hypothesis.  
 b) Write short note on Type I and Type II error. (8M+7M)
7. Four coins were tossed 160 times and the following results were obtained.

|                    |    |    |    |    |   |
|--------------------|----|----|----|----|---|
| No. of heads       | 0  | 1  | 2  | 3  | 4 |
| No. of 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 ( $\alpha = 0.05$ ) (15M)

8. An E-Seva Kendra in a Small town has only one bill receiving window with a cashier handling the cash transaction and giving receipts. He takes on average 5 minutes per customer. The customers come at random with an average of 8 per hour and the arrivals are Poisson in nature. Determine:
  - i) Average queue length
  - ii) Expected idle time of the cashier
  - iii) Expected time a new arrival Spends in system.
  - iv) Expected waiting time of a new arrival before his service is started.
  - v) Probability that a person has to spend for at least 10 minutes in the system.

[Hint :  $\lambda = 8$ ,  $\mu = 10$  per hour] (15M)

Code No: R22011

**R10**
**SET - 2**
**II B. Tech II Semester Regular Examinations August - 2014**
**PROBABILITY AND STATISTICS**

(Com. to CE, CHEM, PE)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions  
 All Questions carry **Equal** Marks

~~~~~

1. a) For any three arbitrary events A, B, C Prove that  

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C).$$
 b) State and prove Baye's Theorem. (8M+7M)
  
2. a) If probability density function  

$$f(x) = \begin{cases} Kx^3 & \text{in } 0 \leq x \leq 3 \\ 0, & \text{elsewhere} \end{cases}.$$
 Find the value of K and find the probability between  $x = \frac{1}{2}$  and  $x = \frac{3}{2}$ .  
 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)  $P(2 \leq x \leq 5)$  (7M+8M)
  
3. a) If the probability is 0.05 that a certain wide-flange column will fail under a given axial load.  
 Find: i) at most two will fail ii) at least four will fail  
 b) If the chance that any of the 10 telephone lines busy at an instant is 0.2. What is the most probability of this number. (8M+7M)
  
4. Samples of size 2 are taken from the population 1, 2, 3, 4, 5, 6 with replacement. Find:
  - i) The mean of the population
  - ii) Standard deviation of the population
  - iii) The mean of the sampling distribution of means.
  - iv) The standard deviation of the sampling distribution of means. (15M)

Code No: R22011

**R10**
**SET - 2**

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. Find the confidence limits for the mean if  $\bar{X} = 82$ ?  
 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 S.D of 0.042. Find maximum error at 95% confidence. Find the confidence limits for the mean if  $\bar{X} = 32$ ? (7M+8M)
6. a) What is meant by Level of Significance?  
 b) Write the formula for testing the hypothesis concerning "Two Means"? (7M+8M)
7. Eight students were given a test in a STATISTICS and after one month coaching they were given another test of the similar nature. The following table gives the increase in 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? (15M)

8. A manager of a local hamburger restaurant, in preparing to open a new fast food restaurant called Hasty Burgers. Based on the arrival rates at existing outlets. Manager expects customers to arrival 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 time is expected to following an exponential distribution. The drive in window is single ever operation.  
 a) What service rate is needed to keep average number of customers in the service system to 4?  
 b) For the service rate in part (a), what is the probability that more than 4 customer are in the line and being served? (15M)

Code No: R22011

**R10**
**SET - 3**
**II B. Tech II Semester Regular Examinations August - 2014**
**PROBABILITY AND STATISTICS**

(Com. to CE, CHEM, PE)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions  
 All Questions carry **Equal** Marks

~~~~~

1. a) An anti-craft gun can take a maximum of 4 shots at an enemy plane moving away from it. The probabilities of hitting the plane at the first, Second, third and fourth shots are 0.4, 0.3, 0.2 and 0.1 respectively. What is the probability that the gun hits the plane?  
 b) Suppose 5 men out of 100 and 25 women out of 10, 000 are color blind. A color blind person is chosen at random. What is the probability of the person being a male? (Assume male and female to be in equal numbers). (7M+8M)

2. a) A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number E of defective items.  
 b) X is a continuous random variable with probability density function given by

$$f(x) = \begin{cases} Kx^{\alpha-1} (1-x)^{B-1}, & \text{for } 0 < x < 1, \alpha > 0, B > 0 \\ 0, & \text{otherwise} \end{cases}$$

Find K and mean value of X.

(7M+8M)

3. a) If the chance that one of the ten telephone lines is busy at an instant is 0.2.  
 i) What is the chance that 5 of the lines are busy?  
 ii) What is the most probable number of busy lines and what is the probability of this numbers?  
 iii) What is the probability that all the lines are busy?  
 b) Fit a binomial distribution to the following frequency data. (8M+7M)

|   |    |    |    |    |   |
|---|----|----|----|----|---|
| x | 0  | 1  | 2  | 3  | 4 |
| y | 28 | 62 | 46 | 10 | 4 |

4. a) A random sample of size 64 is taken from a normal population with  $\mu = 51.4$  and  $S = 68$ . What is the probability that the mean of the sample will  
 i) Exceed 52.9      ii) Fall between 50.5 and 52.3      iii) Be less than 50.6.  
 b) Out of 600 articles selected at random from a batch of 10,000 articles and 35 were found to be defective. How many defective articles would you reasonably expect to have in the whole batch? (7M+8M)

Code No: R22011

**R10**
**SET - 3**

5. The mean mark in mathematics in a common entrance test will vary from year to year. If this variation of the mean mark is expressed subjected by a normal distribution with mean  $\mu_0 = 72$  and variance  $\sigma_0^2 = 5.76$ . i) What probability can we assign to the actual mean mark being somewhere between 71.8 and 73.4 for the next year's test. ii) Construct a 95% Bayesian interval for  $m$  if the from the next incoming class yielding a mean mark of 70 with S.D. of 8. iii) What posterior probability should we assign to the event of part (i). (15M)
6. a) Random samples of 400 men, and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favor of the proposal. Test the hypothesis that proportions of men and women in favor of the proposal are same, at 5% level.  
 b) In a city 250 men out of 750 were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers? (8M+7M)
7. a) A group of 5 patients treated with medicine. 'A' weigh 42, 39, 48, 60 and 41 Kgs. Second group of 7 patients from the same hospital treated with medicine 'B' weigh 38, 42, 56, 64, 68 69 and 62 Kgs. Do you agree with the claim that medicine B increases the weight significantly?  
 b) Memory capacity of 10 students was tested before and after training. State whether the training was effective or not from the following scores. (8M+7M)
- |                 |    |    |    |   |   |    |    |   |   |   |
|-----------------|----|----|----|---|---|----|----|---|---|---|
| Before Training | 12 | 14 | 11 | 8 | 7 | 10 | 3  | 0 | 5 | 6 |
| After Training  | 15 | 16 | 10 | 7 | 5 | 12 | 10 | 2 | 3 | 8 |
8. Patients arrive at a clinic according to a Poisson distribution at the rate of 30 patients per hour. The waiting room can not accommodate more than 13 patients not including the one that is examine? Examination time per patients is exponential with mean rate 20 per hour.  
 i) Find the effective arrival rate at the clinic.  
 ii) What is the probability that an arriving patient will not wait. What is the probability that he finds a vacant seat in the room.  
 iii) What is the expected waiting time until the patient is discharged from the clinic. (15M)

Code No: R22011

**R10****SET - 4****II B. Tech II Semester Regular Examinations August - 2014****PROBABILITY AND STATISTICS**

(Com. to CE, CHEM, PE)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions  
All Questions carry **Equal** Marks

~~~~~

1. a) Among 100 students 50 are studying Mathematics, 30 are studying Physics, and 20 are studying Mathematics and Physics. If a student is chosen at random find the probability that the student is  
i) studying Mathematics or Physics ii) studying neither Physics nor Mathematics.  
b) The probability that three men hit a target respectively are  $1/5$ ,  $2/3$  and  $1/4$ . Find the probability that two shots hit the target. (8M+7M)
2. a) The cumulative distribution function for a continuous random variable  $X$  is
$$F(x) = \begin{cases} 1 - e^{-2x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$$
Find: i) the density function  $f(x)$ , ii) mean and iii) variance of the density function  
b) A sample of 3 items is selected at random from a box containing 10 items of which 4 are defective. Find the expected number of defective items? (8M+7M)
3. a) Prove that Poisson distribution is limiting case of binomial distribution.  
b) If an auditor selects 5 returns from among 15 returns of which 9 contain illegitimate deduction, what the probability that a majority of the selected returns contains illegitimate deductions? (7M+8M)
4. a) The average marks scored by 32 boys are 72 with a S.D of 8. While that for 36 girls is 70 with a S.D of 6. Does this indicate that the boys perform better than girls at level of significance 0.05?  
b) Out of 500 articles selected at random from a batch containing 10000 articles and 30 were found to be defective. How many defective articles would you reasonably expect to have in the whole batch? (7M+8M)
5. a) Determine 99% confidence interval for the mean of contents of soft drink bottles if contents of 7 such soft drink bottles are 10.0, 10.4, 9.8, 10, 9.8, 10.2, 9.6 ml.  
b) A sample of cam shafts intended for use in gasoline engines has an average eccentricity of 1.02 and a standard deviation of 0.044 inch. Assuming the data may be treated a random sample from a normal population; determine a 95% confidence interval for the actual mean eccentricity of a cam shaft? (7M+8M)

Code No: R22011

**R10****SET - 4**

6. a) Among 900 people in a state 90 are found to be chapatti eaters. Construct 99% confidence interval for the true proportion.
- b) In a random sample of 400 industrial accidents, it was found that 231 were due at least partially to unsafe working conditions construct a 99% confidence interval for the corresponding true proportion. (7M+8M)

7. Two random samples are drawn from two normal populations as follows:

A	17	27	18	25	27	29	13	17
B	16	16	20	27	26	25	21	

Test whether the samples are drawn from the same normal population. Use a 0.05 level of significance. (15M)

8. Arrivals at a telephone booth are considered to be Poisson, with an average time of 10 between on arrival and the next. The length of a phone call assumed to be distributed exponentially with mean 3 minutes, then
- i) What is the probability that a person arriving at the booth will have to wait?
- ii) What is the average length of the queues that form from time to time?
- The telephone department will install a second booth when convinced that an arrival would expect to have waited at least three minutes for the phone. By how much must the flow of arrivals be increased in order to justify a second booth? (15M)