Code No: 07A51801 | R07 | Set No. 2

III B.Tech I Semester Examinations,November 2010
PROBABILITY AND STATISTICS
Metallurgy And Material Technology

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Derive formulae for
      i. The mean waiting time in the system.
      ii. Expected waiting time of a customer in a non empty queue
   (b) The customers arrive at a fast food centre at an interval of 11 minutes and they are served at the rate of 1/9 per minute..Find
      i. Average length of the queue
      ii. Average waiting time in the queue   [8+8]

2. (a) Given that 2P(x=0)=P(x=2) for a Poisson variate X. Find the Probability that
      i. x≤3
      ii. 2 < x ≤ 5
      iii. P(x > 2)
   (b) Write the importance of normal distribution   [8+8]

3. (a) Three light bulbs are chosen at random from 12 bulbs of which 5 are defective. Find the probability that
      i. All are defective
      ii. One is defective
      iii. Two are defective.
   (b) The probability of A,B and C to become M.D's of a factory are 1/4, 1/3 and 5/1 2. The probability that bonus scheme will be introduced if they become M.Ds are .02, .03 and .04 Find the probability of becoming M.D's, if scheme will be introduced.   [8+8]

4. Apopulation consists if six numbers 4, 8,12,16.20,24. Consider all Samples of size two which can be taken without replacement from this population. Find
   (a) The population mean
   (b) The population Standard deviation
   (c) The mean of the sampling distribution of mean
   (d) Standard deviation of the sampling distribution of mean   [16]

5. (a) Write about Critical region and one tailed and two tailed tests.

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(b) A candidate for election made a speech in a city. Among 500 voters from city A 59.6% are in favour of him where as among 300 voters from city B 50% are in favour of him. Test the significance between the difference of two proportions at 5% level.

[8+8]

6. (a) Two horses A, 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 at 95% level.

(b) The daily wages in rupees of skilled workers in two cities are as follows.

City	Size of the sample of workers	S.D. of wages in the sample
City A	16	25
City B	13	32

Test at the 0.01 level whether the variances of the wages in two cities are equal.

[8+8]

7. (a) A sample of size 64 and mean 60 was taken from a population whose standard deviation is10.Construct 95% confidence interval for the mean.

(b) A research worker wants to determine the average time it takes a mechanic to rotate the tyres of a car and he wants to be able to assert with 95% confidence that the mean of his sample to off by at most .5 minutes. If standard deviation is1.6 minutes, how large the sample will be ?

(c) One step in the manufacturing process of computer chips is the grinding of the silicon wafers to an average thickness of 0.400 in. Periodically the manufacturer takes a random sample of 40 such wafers and computes the average thickness to see if the machinery needs adjusting. One such sample had a mean thickness of 0.403 with a standard deviation of 0.021 in. Assuming that the thickness of all such wafers is normally distributed, is there evidence to suggest that the manufacturing process needs adjustment? Test at the 5% level of significance.   [5+5+6]

8. (a) A sample of 5 items is selected at random from a box containing 15 items of which 8 are defective find

   i. Mean
   ii. variance of defective items.

(b) 15 % of items from a factory are defective. Find the probability that in a sample of 12

   i. Exactly 9
   ii. At least four
   iii. $P(2 < x < 7)$ are defective   [8+8]

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Code No: 07A51801   **R07**   **Set No. 4**

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PROBABILITY AND STATISTICS
Metallurgy And Material Technology

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
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1. Apopulation consists if five numbers 2,3,6,8,11,. Consider all Samples of size two which can be taken without replacement from this population. Find

   (a) The population mean
   (b) The population Standard deviation
   (c) The mean of the sampling distribution of mean
   (d) Standard deviation of the sampling distribution of means   [16]

2. (a) A class contains 10 men and 20 women of which half the men and half the women have brown eyes. Find the probability that the person is a man or has brown eyes.

   (b) There are three bags. Bag I contains - 1 White, 2 red and 3 green balls
   Bag II- contains- 2 White, 3 red and 1 green balls
   Bag III- contains- 3 White, 1 red and 2 green balls
   One bag is selected and one ball is drawn. Find the probability that it is from
      i. Bag- I
      ii. Bag-II
      iii. Bag-III.   [8+8]

3. (a) The mean height of 50 male students who participated in sports is 68.2 inches with a S.D of 2.5.The The mean height of 50 male students who have not participated in sports is 67.2 inches with a S.D of 2.8. Test the hypothesis that the height of students who participated in sports is more than the students who have not participated in sports.

   (b) A coin is tossed 10000 times and it turns up head 5195 times. Discuss whether the coin may be regarded as unbiased one.   [8+8]

4. (a) A random sample of 10 boys has the following I.Q 70, 120, 110,1 01, 88, 83, 95, 98, 107 and 100. Construct 95%confidence interval for the mean.

   (b) If the average time taken to a mechanic to rotate the tyres of a car is 39.5 minutes.If the sample size is 40 and the standard deviation is 1.6. What confidence can be assert that the sample mean does not differ from the true mean by more than .5 minutes.   [8+8]

5. (a) A continuous Random variable has the p.d.f f(x)= ax in $0 \leq x \leq 1$
   = a, in $1 \leq x \leq 2$
   = 0 else where.
   Find

3

       i. a

      ii. The mean

     iii. variance

  (b) Six cards are drawn from a pack of 52 cards. Getting a diamond is a success. Find the probability of getting the success

      i. At least one

     ii. 4 times.

    iii. None   [8+8]

6. (a) Prove that the Poisson distribution can be approximated by the binomial distribution.

  (b) Suppose that the weights of 800 male students are normally distributed with mean $\mu = 140$ pounds with a standard deviation of 10 pounds. Find the number of students whose weight are

      i. Between 138 and 148

     ii. More than 152   [8+8]

7. Fit a poisson distribution to the following data and test the Goodness of Fit at .05 level of significance.

x	250 had 0	1	2	3	4	5
f	109	65	34	23	3	1

                                                               [16]

8. State and prove arrival theorem.   [16]

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Code No: 07A51801 | **R07** | **Set No. 1**

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1. The following figures refer to the observations in independent samples.

Sample-I	25	30	28	34	24	20	13	32	22	38
Sample-II	40	34	22	20	31	40	30	23	36	17

Analyze whether the samples have been drawn from the populations of equal means.
[16]

2. (a) A card is drawn from a pack of cards. What is the probability that it is either a spade or an ace.

   (b) There are three boxes. Box-I contains 6 red balls and 4 white balls. Box-II contains 5 red and 7 white balls. Box-III contains 3 red and 9 white balls. Find the probability that the ball is

   i. Red
   ii. White. [8+8]

3. (a) In a city 250 men out of 750 men were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers?

   (b) A sample of 900 members has a mean 3.4 cms and S.D 2.81 cms Another sample of 500 members has a mean 4.2 cms and S.D 2.1 cms Test the difference between the means. [8+8]

4. Apopulation consists if five numbers 5, 8, 15, 24, 32. Consider all Samples of size two which can be taken without replacement from this population. Find

   (a) The population mean

   (b) The population Standard deviation

   (c) The mean of the sampling distribution of mean

   (d) Standard deviation of the sampling distribution of mean [16]

5. (a) If X is a poisson variate such that $P(x = 1) = 24P(x = 3)$ Find

   i. $P(x = 0)$
   ii. $P(x < 3)$
   iii. $P(2 < x < 6)$

   (b) 1000 students appear for an examination. It was found that the marks are normally distributed with mean 35 and standard deviation 5. Find the number of students who get

5

     i. Marks between 25 and 40

     ii. Marks below 20

     iii. more than 50   [8+8]

6. (a) A random sample of 16 values from a normal population showed a mean of 41.5 inches and the sum of the squares of deviation from mean is 13.5 inches. Find the maximum error with 99% confidence.

   (b) A sample of size10was taken from a population whose S.D is .03 and the mean is Construct 95% confidence interval for the mean.

   (c) It is claimed that a random sample of 100tyres with a mean life of 15269 is drawn from a population of tyres which has a mean life of 15200 km. and a standard deviation of 1248 km. Test the validity of the claim.   [5+5+6]

7. A repair shop attended by a single mechanic has an average of Four customers per hour, who bring small appliances for repair. The mechanic inspects them for defects and quite often can fix them right away or otherwise render a diagnosis.This takes him 6 minutes on the average.

   (a) Average number of customers in the system.

   (b) Average number of customers in the queue.

   (c) The average time including service, spent by a customer.

   (d) The probability that queue length is greater than or equal to five.

   (e) The probability that an arrival will have to wait for more than 10 minutes.

                                                                     [16]

8. (a) A continuous Random variable has the p.d.f $f(x)=Kx(1-x^2)$ If $0 < x < 1$, $= 0$ otherwise Determine

     i. K

     ii. The mean

     iii. Variance

   (b) Assume that 60% of the students passed. Find the probability that among 12

     i. Exactly 8

     ii. At least 4

     iii. At the most 7 are passed   [8+8]

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R07 **Set No. 3**

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Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
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1. (a) If the probability that an individual suffers a bad reaction from a certain injection is .003. Find the probability that out of 1000 individuals

     i. Exactly 3
     ii. ≥ 3
     iii. None suffers from a bad reaction.

   (b) 1000 students appear for an examination. It was found that the marks are normally distributed with mean 50 and stsandard deviation 10. The students who get more than or equal to 60 will be placed in 1st division, who get between 50 and 60 will be placed in 2nd division, who get between 40 and 50 in 3rd division, Who get more than 75 in distinction and who get less than 40 will be failed. Find the number of students who get

     i. Distinction
     ii. 2nd division
     iii. Failed   [8+8]

2. A firm is engaged in both shipping and receiving activities. The management is always interested in improving the efficiency of new innovations. in loading and unloading procedures. The arrival distribution of tracks is found to be Poisson with arrival rate of 3 trucks per hour. The service time distribution is exponential with unloading time of 9 minutes

   (a) Average number of trucks in the queue

   (b) The probability that queue length is greater than or equal to 5

   (c) The probability that an arrival will have to wait for more than 10 minutes

   (d) The variance of queue length   [16]

3. (a) There are two coins such that the probability of getting head is 2 / 3. If these two coins are tossed, find the probability of getting

     i. At least one head
     ii. Two heads

   (b) There are three boxes. I contains- 10 light bulbs out of which 4 are defective
      II contains- 6 light bulbs out of which 1 is defective
      III contains- 8 light bulbs out of which 3 are defective
      A box is chosen at random and a bulb is selected. If it is defective find the probability that it is from

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      i. Box - I

      ii. Box - II

      iii. Box - III.　　　　　　　　　　　　　　　　　　　　　　　　[8+8]

4. Four methods are under development For making discs of a super conducting material. Fifty discs are made by each method and they are checked for super conductivity when colled with liquid nitrozen.

	Method-I	Method-II	Method-III	Method-IV
Super Conductor	31	42	22	25
Failures	19	8	28	25

Perform a Chi-square test at .o5 level whether there is a significance difference between the proportions. [16]

5. (a) If the maximum error, with 90% confidence is 2.8 and the sample size is 750 then find the standard deviation of the sample .

  (b) If the size of the sample is 9 and the standard deviation is .15 Find the maximum error with 90% confidence.

  (c) In 64 randomly selected hours of production, the mean and the standard deviation of the number of acceptance pieces produced by an automatic stamping machine are 1.038 and .146 At the .05 level of significance does this enable us to reject the null hypothesis $\mu=1.000$ against the alternative hypothesis $\mu > 1.000$? [5+5+6]

6. (a) In a city A 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions is significant at .05 level of significance.

  (b) Samples of students were drawn from two universities and from their weights in kgm and deviations are calculated. Make a large sample test to test the significance of the difference between the means. [8+8]

7. (a) A continuous Random variable has the p.d.f $f(x) = \frac{(3+x)^2}{16}$ if $-3 \le x \le -1$
$= \frac{(6-2x^2)}{16}$ if $-1 \le x \le 1$
$= \frac{(3-x)^2}{16}$ if $1 \le x \le 3$
$= 0$ else where
Find

    i. Mean

    ii. Variance

  (b) A coin is so weighted that the probability of getting head is 2 / 3. 8 such coins are tossed Find the probability of getting head

    i. At least once

    ii. Exactly 4 times

    iii. > 3 times　　　　　　　　　　　　　　　　　　　　　　[8+8]

8

8. A population consists if five numbers 8, 24, 36, 45, 52. Consider all Samples of size two which can be taken without replacement from this population. Find

  (a) The population mean

  (b) The population Standard deviation

  (c) The mean of the sampling distribution of mean

  (d) Standard deviation of the sampling distribution of means [16]

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