Code No: RR220105 **Set No. 1**

II B.Tech Supplimentary Examinations, Aug/Sep 2008
PROBABILITY AND STATISTICS
(Common to Civil Engineering, Mechanical Engineering, Computer Science & Engineering, Chemical Engineering, Information Technology, Mechatronics, Computer Science & Systems Engineering, Electronics & Computer Engineering, Production Engineering, Bio-Technology and Automobile Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) If 4 tickets are drawn from tickets numbered 1 to 30 inclusive, determine the probability that the tickets marked 1 and 2 are among the four of them
   (b) Suppose colored balls are distributed in three indistinguishable boxes as follows:

	$Box-I$	$Box-II$	$Box-III$
Red	2	4	3
white	3	1	4
Blue	5	3	3

   A box is selected at random from which a ball is selected at a random. What is the probability that the ball is colored
   i. red
   ii. blue [6+10]

2. (a) Find the variance of the binomial distribution .
   (b) Determine the probability distribution of the number of bad eggs in a basket containing 6 eggs given that 10% of eggs are bad in a large consignment[8+8]

3. (a) Show that the mean and variance of a Poisson distribution are equal.
   (b) Determine the minimum mark a student should get in order to receive an A grade if the top 10% of the students are awarded A grades in an examination where the mean mark is 72 and standard deviation is 9. [8+8]

4. If the population is 3,6,9,15,27.
   (a) List all possible samples of size 3 that can be taken without replacement from the finite population.
   (b) Calculate the mean of each of the sampling distribution of means.
   (c) Find the standard deviation of sampling distribution of means. [5+5+6]

5. (a) A die is thrown 256 times an even digit turns up 150 times. Can we say that the die is unbiased.
   (b) If we can assert with 95% that the maximum error is 0.05 and p=0.2, find the sample size.

(c) Write about null hypothesis and testing of null hypothesis . [5+5+6]

6. (a) A firm manufacturing rivets wants to limit variation in their length as much as possible. The lengths (in cms.) of 10 rivits manufactured by a new process are

2.15	1.99	2.05	2.12	2.17
2.01	1.98	2.03	2.25	1.93

Examine whether the new process can be considered superior to the old if the old population has standard deviation 0.145 cm.?

(b) The following are the average weekly losses of worker hours due to accidents in 10 industrial plants before and after a certain safety programme was put into operation:

Before:	45	73	46	124	33	57	83	34	26	17
After :	36	60	44	119	35	51	77	29	24	11

Test whether the safety programme is effective in reducing the number of accidents at the level of significance of 0.05? [8+8]

7. (a) Fit a curve of the form $y = ax^b$ for the following data

x	61	26	7	2.6
y	350	400	500	600

(b) Derive normal equations to fit the straight line $y = a_0 + a_1 x$ [10+6]

8. (a) Calculate the coefficient of correlation for ranks if the marks in two subjects x and y are given below.
(x,y) = (5,8); (10,3); (6,2); (3,9); (19,12); (5,3); (6,17); (12,18); (8,22); (2,12); (10,17); (19,20)

(b) If x=2y+3 and y=kx +6 are the regression lines of x, y and y on x respectively

i. shown that $0 \leq k \leq 1/2$

ii. If k = 1/8, find r and $(\overline{x}, \overline{y})$ [8+8]

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Code No: RR220105 **Set No. 2**

II B.Tech Supplimentary Examinations, Aug/Sep 2008
PROBABILITY AND STATISTICS
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Out of 10 girls in a class , 3 have blue eyes. If 2 of the girls are chosen at random, what is the probability that
   i. both have blue eyes
   ii. at least one has blue eyes
   (b) Define conditional probability. Give an example. State the general multiplicative rule and special multiplication rule (when the events are independent) [8+8]

2. (a) Let x be a discrete random variable having the following probability distribution, then
   Find
   i. K
   ii. mean
   iii. variance
   iv. cumulative distribution

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

   (b) The probability that John hits a target is $\frac{1}{2}$He fires 6 times. Find the probability that he hits the target
   i. exactly 2 times
   ii. more than 4 times
   iii. atleast once. [8+8]

3. (a) Average number of accidents on any day on a national highway is 1.8. Determine the probability that the number of accidents are
   i. at least one
   ii. at most one
   (b) If X is a normal variate, Find:
   i. to the left of z = –1.78
   ii. to the right of z = – 1.45

iii. corresponding to – 0.80 ≤ z ≤ 1.53

iv. to the left of z= – 2.52 and to the right of z= 1.83. [8+8]

4. (a) A random sample of 6 steel beams has a mean compressive strength of 58,392 p.s.i. (pounds per square inch) with a standard deviation of 648 p.s.i. Use this information at the level of significance $\alpha = 0.025$ to test whether the true average compressive strength of steel from which this sample came is 58,000 p.s.i. Assume normality?

   (b) Measuring specimens of nylon yarn taken from two machines, it was found that 8 specimans from 1^{st} machine had a mean denier of 9.67 with a standard deviation of 1.81 while 10 specimans from a 2^{nd} machine had a mean denier of 7.43 with a standard deviation 1.48. Assuming the population are normal test the hypothesis H_0 : μ_1 - $\mu_2 = 1.5$ against H_1 : μ_1 - $\mu_2 > 1.5$ at 0.05 level of significance? [8+8]

5. (a) Experiences had shown that 20% of a manufactured product is of the top quality. In one days production of 400 articles only 50 are of top quality. Test the hypothesis at 0.05 level.

   (b) Ten bearings made by a certain process have a mean diameter of 0.5060 cm with a standard deviation of 0.0040 cm. Assuming that the data may be looked upon as a random sample from a normal distribution, construct a 95% confidence interval for the actual average diameter of the bearings? [8+8]

6. Two independent samples of sound 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? [16]

7. (a) Fit a straight line for the following data and construct 95% confidence interval for P.

x	0	5	10	15	20	25
y	12	15	17	22	29	30

   (b) Derive normal equations to fit y=a + bx + cx^2 [10+6]

8. (a) The following table gives experimental values of the three variates X,Y and Z. Fit a multiple regression of the type Z = α X + βY.

X	1	2	3	5
Y	1	3	4	2
Z	7	18	25	23

   (b) The following are the marks obtained by 12 students in Economics and Statistics:

Economics(x)	78	56	36	66	25	75	82	62
Statistics(y)	84	44	51	58	60	68	62	58

   Compute the Spearman rank correlation coefficient between x and y [8+8]

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Code No: RR220105 **Set No. 3**

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) A class has 10 boys and 5 girls. Three students are selected at random one after the other. Find the probability that
   i. first two are boys and third is girl
   ii. first and third of same sex and second is of opposite sex.
   (b) A box contains n tickets marked 1 through n. Two tickets are drawn without replacement. Determine the probability that the number on the tickets are consecutive integers. [8+8]

2. (a) A pair of dice are thrown. Let the random variable X assign to each point (a,b) in S the sum of its numbers.
   i. Find the distribution of X
   ii. the mean of the random variable
   iii. the variance of the random variable.
   (b) The probability that a student is successful in a mathematics examination is 0.4. If 15 students appear for the examination determine the probability that
   i. at least 10
   ii. from 3 to 8 are successful. [8+8]

3. (a) Prove that Poisson distribution is the limiting case of Binomial distribution for very large number of trials with very small probability.
   (b) Assume that the reduction of a person's oxygen consumption during a period of transcendental meditation (TM) is a continuous random variable X with mean 37.6 cc/mt and standard deviation 4.6 cc/mt. Determine the probability that during a period of TM a person's oxygen consumption will be reduced by
   i. atleast 44.5 cc/mt
   ii. atmost 35.0 cc/mt [8+8]

4. (a) If the distribution of all weights of all men traveling by train from Hyderabad to Delhi has a mean of 70 kgs and a standard deviation of 4 kgs, what is the probability that the combined gross weight of 36 such men is more than 300 kgs.

(b) It has been suggested that an average college teacher in Andhra Pradesh spends less than 10 hours in a week on his own academic schedule. The figures for the time spent during a week are given below for 12 teachers:

7.1	13.1	7.8	3.6	8.4	4.9
9.6	3.4	0.1	7.2	20.3	11.1

Is the claim justified with the level of significance of 0.05? [8+8]

5. (a) A lady stenographer claims that she can take dictation at the rate of 118 words per minute can we reject her claim on the basis of 100 trials in which she demonstrates a mean of 116 words and a S.D of 15 words.

(b) In a large consignment of oranges a random sample of 64 oranges revealed that 14 oranges were bad. If it reasonable to ensure that 20% of the oranges are bad? [8+8]

6. (a) Five measurements of tar content of a certain kind of cigarettes yielded 14.5, 14.2, 14.4, 14.3 and 14.6 mg per cigarettes. Show that the difference between the mean of this sample $\bar{x} = 14.4$, and the average tar claimed by the manufacturer $\mu = 14.0$, is significant at $\alpha = 0.05$. Assume normality?

(b) Mechanical Engineers, testing a new arc welding technique, classified welds both with respect to appearance and an X-ray inspection.

		Quality			
		Bad	*Normal*	*Good*	*Total*
X-ray	Bad	20	7	3	30
	Normal	13	51	16	80
	Good	7	12	21	40
	Total	40	70	40	150

Test for independence using $\alpha = 0.05$ and find the individual cell contribution to the χ^2 - statistic. [8+8]

7. (a) The following data pertain to the demand for a product (in thousands of units) and its price (in cents) charged in five different market areas:

Price (x)	20	16	10	11	14
Demand	22	41	120	89	56

Fit a parabola of the form $y = a_o + a_1 x$ to the above data

(b) Fit the model $y = ax^b$ to the following data:

x:	1	2	3	4	5	6
y:	2.98	4.26	5.21	6.10	6.80	7.50

[8+8]

8. The following are the data on the number of twists required to break a certain kind of forged alloy bar and the percentage of two alloying elements present in the metal. Fit at least sequence regression line on x_1 and x_2.

No. of tuirists	(y)	41	49	69	65	40	50	58	57	31	36	44	57	19	31	33	43
% of elements of A	(x_1)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
% of elements of B	(x_2)	5	5	5	5	10	10	10	10	15	15	15	15	20	20	20	20

[16]

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Code No: RR220105 **Set No. 4**

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

Answer any FIVE Questions
All Questions carry equal marks

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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) In a certain town 40% have brown hair, 25% have brown eyes and 15% have both brown hair and brown eyes. A person is select at random from the town
      i. If he has brown hair, what is the probability that he has brown eyes also
      ii. If he has brown eyes, determine the probability that he does not have brown hair [8+8]

2. (a) Define random variable, discrete probability distribution, continuous probability distribution and cumulative distribution. Give an example of each.
   (b) 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. at least 2 and at most 9 , are good in mathematics. [8+8]

3. (a) The mean diameter is 12 mm and standard deviation 0.02 mm in a sample of 200 washers produced by a machine. Find the percentage of washers produced whose diameters lie
      i. within 11.97 to 12.03 mm
      ii. outside 11.97 and 12.03 mm
   (b) Suppose the heights of American men are normally distributed with mean=68 inches and standard deviation 2.5 inches. Find the percentage of people whose heights lie between
      i. 66 inches and 71 inches
      ii. atleast 6ft. [8+8]

4. If the population is 3,6,9,15,27.

(a) List all possible samples of size 3 that can be taken without replacement from the finite population.

(b) Calculate the mean of each of the sampling distribution of means.

(c) Find the standard deviation of sampling distribution of means. [5+5+6]

5. (a) In a random sample of 125 cola drinkers, 68 said they prefer thumsup to pepsi. Test the null hypothesis p = 0.5 against the alternate hypothesis p>0.5

(b) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs. 487 with a standard deviation Rs. 48. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 472 to 502? [8+8]

6. Salaries for 200 males and 300 females at a certain company are as indicated in the following frequency table, where the notation (a,b) means a salary grater than or equal to a, but less than b.

	1[20,30)	2 [30,40)	3 [40,50)	4 [50,60)	5 ≥60 to 60
Male	20	34	46	69	40
Female	45	78	90	62	25

Use chi-square test at 0.05 level of significance whether the salary distributions are same. [16]

7. (a) Derive normal equations to fit the curve y = ax + bx^2

(b) Obtain a relation of the form y = a. $(b)^x$ for the following data by the method of least squares. [6+10]

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	17.4

8. (a) obtain the rank correlation coefficient for the following data.

X	68	64	75	50	64	80	75	40	55	64
y	62	58	687	45	81	60	68	48	50	70

(b) If θ is the angle between the two regression lines of y on x and x on y, then prove that. $\tan\theta = \left(\frac{1-r^2}{r}\right)\left(\frac{\sigma_x\,\sigma_y}{\sigma_x^2+\sigma_y^2}\right)$ where r is the coefficient of correlation between x and y and $\sigma_x^2 and\, \sigma_y^2$ are variances of x and y . [10+6]

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