Code No: R09220101 **R09** **Set No. 2**

II B.Tech II Semester Examinations,April/May 2012
PROBABILITY AND STATISTICS
Common to Civil Engineering, Chemical Engineering, Information Technology

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1.(a) Memory capacity of 10 students were tested before and after training. State whether the training was effective or not from the following scores.

Before training	12	14	11	8	7	10	3	0	5	6
After training	15	16	10	7	5	12	10	2	3	8

(b) In one sample of 10 observations, the sum of the squares of the deviations of the sample values from sample mean was 120 and in the other sample of 12 observations, it was 314, test whether the difference is significant at 5% level. [15]

2. (a) A trucking firm suspects the claim that average life of certain tyres is atleast 28,000 miles. To check the claim the firm puts 40 of these tyres on its trucks and gets a mean life time of 27463 miles with a standard deviation of 1348 miles. Can the claim be true?

(b) The mean height of 50 male students who participated in sports is 68.2 inches with a S.D of 2.5. The mean height of 50 male students who have not participated in sport 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. [7+8]

3. (a) From a sample of 200 pairs of observation the following quantities were calculated.
$\sum x = 11.34$, $\sum y = 20.78$, $\sum x^2 = 12.16$
$\sum y^2 = 84.96$, $\sum xy = 22.13$ from the above data. Compute the coefficients of the equation y = a +bk.

(b) Show that the maximum value of the rank correlation coefficient is 1. [7+8]

4. Prove the following result. If the stakes are doubled while the initial capitals remain unchanged the probability of rein decreases for the player whose probability of success P<1/2. [15]

5. (a) A problem in Mechanics is given to three students A,B,and C, whose chances of solving it are $\frac{1}{2}$,$\frac{3}{4}$, and $\frac{1}{4}$ respectively
what is the probability that the problem is solved?

(b) A fair die is tossed. Let the random variable X denote the twice the number appering on the die:

i. Write the probability distribution of X
ii. The mean
iii. The variance [7+8]

6. A computer shop has a laser printer. The jobs for laser printing are randomly distributed approximately a poisson distribution with mean service rate of 10 jobs per hour, since job pages very in length (pages to be printed). The jobs arrive at a rate of 6 per hour during the entire 8 hours work day. If the laser printer is valued Rs.30/- per hour, determine.
   (a) The percent time an arriving jobs has to wait.
   (b) Average system time.
   (c) Average idle time cost of the printer per day. [15]

7. Find the probability of getting an even number 3 or 4 or 5 times in throwing 10 dice. using
   (a) binomial distribution
   (b) normal distribution [7+8]

8. (a) In a study designed to investigate whether certain detonators used with explosives in coal mining meet the requirement that at least 90% will ignite the explosive when charged. It is found that 174 of 200 detonators function properly. Test the null hypothesis P=0.9 against the alternative hypothesis P≠0.9 at the 0.05 level of significance
   (b) Among the items produced by a factory out of 800, 65 were defective in another sample out of 300, 40 were defective. Test the significance between the differences of two proportions at 1% level. [15]

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Code No: R09220101 **R09** **Set No. 4**

II B.Tech II Semester Examinations,April/May 2012
PROBABILITY AND STATISTICS
Common to Civil Engineering, Chemical Engineering, Information Technology

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. A random sample of 300 shoppers at a supermarket includes 204 who regularly use cents off coupons. In another sample of 500 shoppers at a supermarket includes 75 who regularly use cents off coupons
   (a) Construct confidence interval for the probability that any one shopper at the supermarket, selected at random, will regularly use cents off coupons.
   (b) Test the significance between the difference of two proportions at 2% level. [15]

2. (a) Two dice are thrown. Let A be the event that the sum of the digits on the faces is 9. Let B be the event that at least one is 6. Find:
      i. $P(A \cup B)$
      ii. $P(A^C \cap B)$
      iii. $P(A^C \cap B^C)$
      iv. $P(A^C \cup B^C)$
   (b) The probability density function is y=$\begin{cases} K(3x^2-1) \text{ in } -1 \leq x \leq 2 \\ 0 \text{ else where} \end{cases}$
   Find
      i. K
      ii. P($-1 \leq x \leq 0$) [8+7]

3. (a) Is the matrix $\begin{bmatrix} 0.4 & 0.6 & 0 & 0 \\ 0.3 & 0.7 & 0 & 0 \\ 0.2 & 0.4 & 0.1 & 0.3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ irreducible.
   (b) Find the periodic and aperiodic states of the following transition matrix $\begin{bmatrix} 0 & 0 & 1 \\ 1/2 & 1/4 & 1/4 \\ 0 & 1 & 0 \end{bmatrix}$. [15]

4. (a) Poisson varibale has a double mode at x=2 and x=3, find the maximum probability and also find $p(x \geq 2)$
   (b) If the masses of 1000 students are normally distributed with mean 75 kgs and standard deviation 10kgs. How many students have masses
      i. Greater than 90 kgs

ii. Between 65 and 88 kgs. [7+8]

5. (a) Find the standard error of difference between the means and also find the confidence interval for difference the means at 0.05 level from the following data.

	Size	Mean	Standard deviation
Sample 1	9	69	4
Sample 2	10	68	5

(b) The nicotent in milligrams of two samples of tobacco were found to be as follows. Find the standard error and confidential limits for the difference between the means at 0.05 level. [15]

Sample A	24	27	26	23	25	
Sample B	29	30	30	31	24	36

6. Trains arrive at the marshalling yard at the rate 20 trains per day and the service time for each train is 40 minutes. If the line capacity of the yard is limited to 6, find

(a) The probability that the yard is empty.

(b) The average number of trains in the system. [15]

7. Find Karl pearson's correlation co-efficient for the following paired data. [15]

Wages	100	101	102	102	100	99	97	98	96	95
Cost of living	98	99	99	97	95	92	95	94	90	91

8. (a) In a study of an automobile insurance a random sample of 80 body repair costs had a mean of Rs.472.36 and a standard deviation of Rs.62.35. If $\overline{x}$is used as point estimate to the true average repair costs, with what confidence we can assert that the maximum error does not exeed Rs.10?

(b) An ambulance service claims that it takes on the average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and variance 16 minutes. Test the claim at 0.05 level of significance. [7+8]

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Code No: R09220101 **R09** **Set No. 1**

II B.Tech II Semester Examinations,April/May 2012
PROBABILITY AND STATISTICS
Common to Civil Engineering, Chemical Engineering, Information Technology

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. Telephone users arrive at a booth following a poisson distribution with a average time of 5 minutes between two successive arrivals. The time taken for a telephone call is on an average 3 minutes and it follows an exponential distribution. What is the probability that the booth is busy? It is proposed to reduce the average waiting time to less than or half of the present waiting time for completion of the call by establishing a new booth. What has to be the arrival rate so as to warrant the establishment of a new booth. [15]

2. A population consists of six 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. [15]

3. (a) A,B and C in order toss a coin. The first one who toss a head wins the game. What are their probabilities of winning, assuming that the game will continue indefinitely
   (b) A random variable X has the following distribution

x	1	2	3	4	5	6
P(x)	$\frac{1}{36}$	$\frac{3}{36}$	$\frac{5}{36}$	$\frac{7}{36}$	$\frac{9}{36}$	$\frac{11}{36}$

   Find
   (a) The mean
   (b) variance.
   (c) $P\,(1 < x < 6)$ [7+8]

4. Following are the ranks obtained by 10 students in two subjects, statistics and mathematics. To what extent the knowledge of the students in two subjects is related? [15]

Statistics	1	2	3	4	5	6	7	8	9	10
Mathematics	2	4	1	5	3	9	7	10	6	8

5. (a) 20 people were attacked by a disease and only 18 survived. Will you reject the hypothesis that the survival rate of attack by this disease is 85% in favour of the hypothesis that is more at 5% level?

(b) Among the items produced by a factory out of 500, 15 were defective in another sample out of 400, 20 were defective. Test the significance between the differences of two proportions at 5% level. [15]

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

   (b) In a certain factory there are two independent processes for manufacturing the same item. The average weight in a sample of 700 items produced from one process is found to be 250 gms with a standard deviation of 30 gms while the corresponding figures in a sample of items from the other process are 300 and 40. Is there significant difference between the mean at 1% level. [7+8]

7. A random sample of 10 bags of pesticide are taken whose weights are 50, 49, 52, 44, 45, 48, 46, 45, 49, 45 (in kgs). Test whether the average packing can be taken to be 50 kgs. [15]

8. A training process is considered as a two state markovchain. If it rains it is considered to be in state 0 If it does not rain, the chain is in the state of 1. The transition probability of the marker chain is defined by $P = \begin{bmatrix} 0.6 & 0.4 \\ 0.2 & 0.8 \end{bmatrix}$
   Find the probability that it will rain for three days from today assumings that it is raining today assume that the mutual probabilities of state 0 or state 1 as 0.4 and 0.6 respectively. [15]

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Code No: R09220101 **R09** **Set No. 3**

II B.Tech II Semester Examinations,April/May 2012
PROBABILITY AND STATISTICS
Common to Civil Engineering, Chemical Engineering, Information Technology

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain Chi-Square (x^2) distribution and its properties, applications.
   (b) A survey of 240 families with 4 children each revealed the following distribution.

No. of boys	4	3	2	1	0
IQ After training	10	55	105	58	12

   Is the result consistent with the hypothesis that male and female births are equally probable? [15]

2. (a) If 2% of light bulbs are defective. Find
      i. At least one is defective.
      ii. Exacltly 7 are defective
      iii. $p(1 < x < 8)$ in a sample of 100
   (b) The man inside diameter of a sample of 200 washers producted by a Machine is. 500 cms with standard deviation 0.005 cms. The purpose of which these washers are intended a maximum tolerance in the diameter 0.495 to 0.505 cms. otherwise the washers are considered defective. Determine the precentage of defective washers produced by the machine, assuming the diameters are normally distributed. [7+8]

3. Customers arrive at the first class ticket counter of a theatre at a rate of 12 per hour. One clerk is serving the customers at the rate of 30 per hour. The arrivals are poisson in nature and the service time follows exponential distribution. Find
   (a) Probability that there is no customer at the counter.
   (b) Probability that there are more than two customers at the counter.
   (c) Probability that there is no customer waiting to be served.
   (d) Probability that a customer is being served and no body is waiting. [15]

4. (a) A die is so weighted that P(1) = 0.1, P(2) = 0.3,P(3) = 0.2, P(4) = 0.1 P(5) = 0.1 and P(6) = 0.2, A = {1,3,5}, B = {2,3,4,5}, C = {x/x < 3}
   Find:
      i. P(A ∩ B)
      ii. P(A ∩ C)
      iii. P(B ∩ C)

(b) A random sample with replacement of size 2 is taken from S = {1,2,3} Let the random variable X denote the sum of the two numbers taken:

i. Write the probability distribution of X.

ii. Find the mean.

iii. Find the variance. [7+8]

5. Which of the following matrices are regular [15]

(a) $\begin{bmatrix} 1/3 & 0 \\ 1/3 & 1 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1/2 & 1/4 & 1 \\ 0 & 1/2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

6. (a) If θ is the angle between two regression lines, the standard deviation of Y is twice the standard deviation of X and r = 0.25 Find Tan θ.

(b) If σ x= σy= σ and the angle between the regression lines is $\tan^{-1}\frac{4}{3}$. Find the coefficient of correlation. [15]

7. (a) Derive a formula to find the confidence interval between the proportions and the Maximum error.

(b) In a health survey of a certain community, 150 persons were interviewed. One of the items of information obtained was the number of prescriptions each person had filled during the past year. The mean number of prescriptions for the 150 people was 5.8 with a standard deviation of 3.1 The investigator wishes to know if these data provide sufficient evidence to indiate at the 5% level that the population mean is greater than 5. [7+8]

8.(a) In a random sample of 200 claims field against an insurance company writing collision insurance on cars 84 exceeds 1200, construct a 99% confidence interval of the true proportion of claims field against this insurance company that exceeds 1200.

(b) During a country wide investigation the incidence of tuberculosis was found to be 1%. In a college of 400 students 3 reported to be affected, where as in another college of 1200 students 10 were affected. Does this indicate any significant difference? [15]

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