

R16**SET - 1**

Code No: R1621011

II B. Tech I Semester Regular/Supplementary Examinations, October/November - 2018
PROBABILITY AND STATISTICS
 (Civil Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answer **ALL** the question in **Part-A**
 3. Answer any **FOUR** Questions from **Part-B**

PART -A

1. a) If the probability of a defective bolt is 0.2 find mean and standard deviation of the distribution of bolts in a total of 400 2M
- b) If probability density function is $f(x) = \begin{cases} kx^3 & \text{for } 0 \leq x \leq 3 \\ 0, & \text{elsewhere} \end{cases}$. Find the value of k and find the probability between $x = 1/2$ and $x = 3/2$ 2M
- c) A random sample of size 100 has a standard deviation of 5. What can you say about the maximum error with 95% confidence? 2M
- d) A random sample of size 25 from a normal population has the mean $\bar{X} = 47.5$ and the standard deviation $S=8.4$. Does this information tend to support or refute the claim that the mean of the population is $\mu=42.5$ 2M
- e) Find mean values of X and Y from the following regression equations $2Y-X-50=0$, $3Y-2X-10=0$ 3M
- f) Measurements of average \bar{X} and range \bar{R} from 20 samples each of size 5 gave the following results $\bar{X}=99.6$, $\bar{R} = 7.0$. Determine the vales of control limits for drawing a mean chart (Given that for $n=5$, mean range $2.32X$ population standard deviation) 3M

PART -B

2. a) If a Poisson distribution is such that $3P(X = 1) = 2P(X = 3)$. Find 7M
 (i) $P(X \geq 1)$ (ii) $P(X \leq 3)$ (iii) $P(2 \leq X \leq 3)$.
- b) The probability density function of a variate X is 7M

X	0	1	2	3	4	5	6
P(X)	k	3k	5k	7k	9k	11k	13k

Find (i) k (ii) $P(3 < X \leq 6)$ (iii) what will be the minimum value of k so that $(X \leq 2) > 0.3$?

3. a) The life of LED bulbs of a certain type may be assumed to be normally distributed with mean 155 hours and standard deviation 19 hours. Determine the probability that the life of a randomly chosen bulb 7M
 (i) is between 136 hours and 174 hours
 (ii) less than 117 hours (iii) will be more than 395 hours
- b) Define moment generating function and explain how moment generating function is used to obtain moments 7M

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4. a) Sample of size 2 are taken from the population 1,2,3,4,5,6 with replacement. Find (a) the mean of the population (b) the standard deviation of the population (c) the mean of the sampling distribution of means and (d) the standard deviation of the sampling distribution of means 7M
- b) A random sample of size 81 was taken whose variance is 20.25 and mean is 32, construct 98% confidence interval 7M

5. a) 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 250gms with standard deviation of 30gms while corresponding item in a sample of 300 items from the other process are 300 and 40. Is there significant difference between the mean at 1% level. 7M
- b) 200 digits were chosen at random from a set of tables. The frequencies of digits are shown below 7M

Digit	0	1	2	3	4	5	6	7	8	9
Frequency	18	19	23	21	16	25	22	20	21	15

Use χ^2 test to assess the correctness of the hypothesis that the digits were distributed in equal number in the tables from which these were chosen.

6. a) Fit a polynomial of second degree to the data points given below 7M

x	0	1	2
y	1	6	17

- b) Find the coefficient of correlation between X and Y 7M

X	1	2	3	4	5	6	7	8	9
Y	12	11	13	15	14	17	16	19	18

7. The following are the sample means and ranges for ten samples each of size 5. Construct \bar{X} chart and \bar{R} chart and determine whether the process is in control 14M

Sample	1	2	3	4	5	6	7	8	9	10
Mean \bar{X}	20	34	45	39	26	29	13	34	37	23
Range R	23	39	15	05	20	17	21	11	40	10

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R16**SET - 2**

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PART -A

1. a) In eight throws of a die 5 or 6 is considered as success. Find the mean number of success and the standard deviation 2M
- b) The continuous random variable X has the probability density function

$$f(x) = \begin{cases} 2/x^3, & \text{if } 1 < x < \infty \\ 0, & \text{otherwise} \end{cases}$$
 Find F(x) 2M
- c) A research worker wants to determine the average time it takes a machine to rotate the tyres of a car and he wants to be able to assert with 95% confidence that the mean of the sample is off by at most 0.5 minutes. If we can presume from past experience that $\sigma=0.6$ minutes, how large a sample has to considered 2M
- d) A process of making certain ball bearings is under control if the diameters of the bearings have a mean of 0.5 cm. If the random sample of 10 of these bearings has a mean diameter of 0.5060cm and standard deviation of 0.0040cm, is the process under control? 2M
- e) Test whether the equations $2x+3y=4$, $x-y=5$ represent valid regression lines 3M
- f) A drilling machine bores holes with a mean diameter of 0.5230cm and a standard deviation of 0.0032cm. calculate the 2-sigma upper and lower control limits for means of samples 4. 3M

PART -B

2. a) If 2% of mobile phones of a company are defective, find the probability that (i) at least one defective (ii) exactly 7 defective (iii) at most 8 defectives in a sample of 100 7M
- b) From a lot of 10 items containing 3 defectives, a sample of 4 items is drawn at 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. 7M
3. a) In a test of 1000 tube lights it was found that the life of a certain make was assumed to be normally distributed with an average life of 2040 hours and standard deviation of 60 hours. Find the number of tubes likely to burn for
 - (i) more than 2150 hours
 - (ii) less than 1950 hours and
 - (iii) more than 1920 hours and but less than 2160 hours7M
- b) Find moment generating function of normal distribution 7M

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4. a) A population consists of five numbers 2,3,6,8,11. Consider all possible samples of size two which can be drawn with replacement from this population. Find (a) the mean of population (b) the standard deviation of the population (c) the mean of the sampling distribution of means and (d) the standard deviation of the sampling distribution of means 7M
- b) A random sample of size 100 is taken from a population with standard deviation 5.1. Given that the sample mean is 21.6. construct 95% confidence interval for the population 7M
5. a) The mean height of 50 male students who participated in sports is 68.2 inches with standard deviation of 2.5. The mean height of 50 male students who have not participated in sports is 67.2 inches with standard deviation of 2.8. Test the hypothesis that the height of the students who participated in sports is more than the students who have not participated in sports. 7M
- b) Three samples each of size 5, were drawn from the three uncorrelated normal populations with equal variance. Test the hypothesis that population means are equal at 5% level. 7M

Sample 1	Sample 2	Sample 3
10	9	14
12	7	11
9	12	15
16	11	14
13	11	16

6. a) Obtain a relation of the form $y = ab^x$ for the following data 7M

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	127.4

- b) Find Karl Pearson's coefficient of correlation from the following data 7M

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

7. The table below gives the sample means and ranges for ten samples each of size 5. Construct Control Charts for mean and range and test whether the process is in control or not 14M

Sample No	1	2	3	4	5	6	7	8	9	10
Mean	4.9	4.9	5.0	4.9	4.9	5.0	5.0	4.9	4.9	4.9
Range	0.3	0.2	0.4	0.1	0.4	0.2	0.7	0.4	0.4	0.5

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R16**SET - 3****II B. Tech I Semester Regular/Supplementary Examinations, October/November - 2018****PROBABILITY AND STATISTICS**

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)2. Answer **ALL** the question in **Part-A**3. Answer any **FOUR** Questions from **Part-B****PART -A**

1. a) If a random variable has a Poisson distribution such that $P(1) = P(2)$, find mean and variance of the distribution 2M
- b) Find the constant k such that
- $$f(x) = \begin{cases} kx^2, & \text{if } 0 < x < 3 \\ 0, & \text{otherwise} \end{cases}$$
- is a probability function and find the distribution function F(x) 2M
- c) If we can assert with 95% that the maximum error is 0.05 and $p=0.2$ find the size of the sample 2M
- d) A die is tossed 960 times and it falls with 5 upwards 184 times. Is the die unbiased at the level of significance of 0.01? 2M
- e) If $X=2Y+3$ and $Y= kX+6$ are the regression lines of X on Y and Y on X respectively. Then show that $0 \leq k \leq 1/2$ 3M
- f) A drilling machine bores holes with a mean diameter of 0.5230cm and a standard deviation of 0.0032cm. calculate the 3-sigma upper and lower control limits for means of samples 4. 3M

PART -B

2. a) 20% of items produced from the factory are defective. Find the probability that in a sample of 5 chosen at random (i) none is defective (ii) one is defective (iii) $p(1 < x < 4)$ 7M
- b) A random variable X has the following probability distribution 7M

X	0	1	2	3	4	5	6	7	8
P(X)	k	3k	5k	7k	9k	11k	13k	15k	17k

Determine (i) k (ii) $p(x < 3)$ (iii) $p(X \geq 3)$ (iv) $p(0 < x < 5)$ (v) Find distribution function F(x)

3. a) The marks obtained in Concrete Technology by 1000 students are normally distributed with mean 78% and standard deviation 11%. Determine 7M
- (i) how many students got marks above 90%
- (ii) what was the highest mark obtained by the lowest 10% of the students
- (iii) within what limits did the middle of 90% of students lie
- b) Find moment generating function of a random variable X having probability 7M

$$\text{density function } f(x) = \begin{cases} x, & \text{if } 0 \leq x < 1 \\ 2 - x, & \text{if } 1 \leq x < 2 \\ 0, & \text{elsewhere} \end{cases}$$

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4. a) A population consists of five numbers 4,8,12, 20,24. Consider all possible samples of size two which can be drawn with replacement from this population. Find (a) the mean of population (b) the standard deviation of the population (c) the mean of the sampling distribution of means and (d) the standard deviation of the sampling distribution of means 7M
- 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 standard deviation of 0.042. Find maximum error at 95% confidence interval. Find confidence limits of the mean if $x = 32$. 7M

5. a) In a big city 325 men out of 600 men were found to be smokers. Does this information support the conclusion that the majority of the men in this city are smokers? 7M
- b) Three different machines are used for a production. On the basis of the outputs, test whether the machines are equally effective. 7M

OUTPUTS		
Machine 1	Machine 2	Machine 3
10	9	20
5	7	16
11	5	10
10	6	4

6. a) Determine the equation of a straight line which best fits for the data 7M

X	10	12	13	16	17	20	25
Y	10	22	24	27	29	33	37

- b) Calculate coefficient of correlation from the following data 7M

X	12	9	8	10	11	13	7
Y	14	8	6	9	11	12	3

7. The following data are the sample means and ranges for ten samples each of size 5. Construct Control Charts for mean and range and comment on the nature of control 14M

Sample No	1	2	3	4	5	6	7	8	9	10
Mean	12.8	13.1	13.5	12.9	13.2	14.1	12.1	15.5	13.9	14.2
Range	2.1	3.1	3.9	2.1	1.9	3.0	2.5	2.8	2.0	2.5

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R16**SET - 4****II B. Tech I Semester Regular/Supplementary Examinations, October/November - 2018****PROBABILITY AND STATISTICS**

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 2. Answer **ALL** the question in **Part-A**
 3. Answer any **FOUR** Questions from **Part-B**

PART -A

1. a) A car-hire firm has two cars which it hires day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate proportion of days on which there is no demand in an year. 2M
- b) If X is a continuous random variable with probability density function $f(x) = \begin{cases} x^2, & \text{if } 1 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases}$. If $P(c \leq x \leq 1) = 19/81$. Find the value of c . 2M
- c) It is desired to estimate the mean time of continuous use until an answering machine will first require service. If it can be assumed that $\sigma = 60$ days, how large a sample is needed so that one will be able to assert with 90% confidence that the sample mean is off by at most 10 days. 2M
- d) A sample of 64 students have a mean weight of 70kgs. Can this be regarded as a sample from a population with mean weight 56 kg. and standard deviation 25kg. 2M
- e) If $X=2Y+3$ and $Y= kX+6$ are the regression lines of X on Y and Y on X respectively. If $k=1/8$ find r 3M
- f) Explain the term statistical control. Discuss its aspects and advantages. 3M

PART -B

2. a) Probability that Ms.Uma hits a target is $1/2$. She fires 6 times. Find the probability that she hits the target (i) exactly 2 times (ii) more than 4 times (iii) at least once. 7M
- b) A random variable X has the following probability function 7M
- | | | | | | | | |
|------|----|-----|----|-----|----|-----|----|
| X | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| P(X) | k | 0.1 | k | 0.2 | 2k | 0.4 | 2k |
- Find (i) k (ii) Mean (iii) Variance
3. a) 1000 students have written an examination the mean of the test is 35 and standard deviation is 5. Assuming the distribution to be normal, find 7M
- (i) how many students marks lie between 25 and 40
- (ii) how many students get more than 40
- (iii) how many students get below 20
- (iv) how many students get more than 50
- b) Find moment generating function of a random variable X having probability density function $f(x) = \begin{cases} \frac{1}{3}, & \text{if } -1 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$ 7M

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4. a) Sample of size 2 are taken from the population 3,6,9,15,27 with replacement. Find (a) the mean of the population (b) the standard deviation of the population (c) the mean of the sampling distribution of means and (d) the standard deviation of the sampling distribution of means 7M
 b) In a sample of 100 packages shipped by air freight 13 had some damage. Construct 95% confidence interval for the true proportion of damage package 7M

5. a) In a hospital 480 females and 520 male babies were born in a week. Does these figures confirm the hypothesis that males and females are born in equal number? 7M
 b) A die is thrown 264 times with the following results. Show that the die is biased. [Given $\chi^2_{0.05} = 11.07$ for 5 degrees of freedom] 7M

No. Appeared on the die	1	2	3	4	5	6
Frequency	40	32	28	58	54	52

6. a) Fit a curve $y = ae^{bx}$ to the data points given below 7M

x	0	2	4
y	5.1	10	31.1

- b) Calculate coefficient of correlation for the data 7M

X	9	8	7	6	5	4	3	2	1
Y	15	16	14	13	11	12	10	8	9

7. The following data gives readings 10 samples of size 6 each in the production of a certain component. 14M

Sample	1	2	3	4	5	6	7	8	9	10
Mean \bar{X}	383	508	505	582	557	337	514	614	707	753
Range R	95	128	100	91	68	65	148	28	37	80

Draw Control Charts for \bar{X} (for $n = 6, A_2 = 0.483$). What is your conclusion