Code No: R1621011 **R16** SET - 1

II B. Tech I Semester Supplementary Examinations, October/November – 2020
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**

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PART –A

1. a) Define a distribution function for a discrete random variable. (2M)
   b) Define a continuous random variable and given an example. (2M)
   c) Define Population and Sample with examples. (3M)
   d) Define one-tailed and two-tailed tests. (2M)
   e) State the principle of lest-squares and write normal equations for fitting of $y = a + bx$. (3M)
   f) Write the control line and three – sigma limits for the mean chart? (2M)

PART –B

2. a) Given that $f(x)=\frac{k}{2^x}$ is a probability distribution for a random variable that can take on the values $x = 0,1,2,3,4$.
   (i) Find the value of k.
   (ii) Find an expression for the distribution function $F(x)$ of the random variable. (7M)
   b) Define the binomial distribution and find its mean and variance. (7M)

3. a) Define mathematical expectation and write its properties. (7M)
   b) Let X be a continuous random variable having probability density function (7M)

$$f(x)=\begin{cases}2e^{-2x} & for\ \ x>0\\ 0 & \text{elsewhere}\end{cases}$$

Find moment generating function and obtain $E(X)$ and $E(X^2)$ by differentiating the moment generating function.

4. a) Determine the probability that $\overline{X}$ will be between 22.39 and 22.41 if a random sample of size 36 is taken from an infinite population having the mean $\mu = 22.4 \ and \ \sigma = 0.048$. (7M)
   b) Find the value of $F_{0.99}$ for $\nu_1 = 6 \ \ and \ \ \nu_2 = 20$ degrees of freedom. (7M)

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5. a) A company claims that its light bulbs are superior to those of its main competitor. If a study showed that a sample of $n_1 = 40$ of its bulbs has a mean life time of 1647 hours of continuous use with a standard deviation of 27 hours, while a sample of $n_2 = 40$ bulbs made by its main competitor had a mean lifetime of 1638 hours of continuous use with a standard deviation of 31 hours, does this substantiate the claim at the 0.05 level of significance? (7M)

   b) An urban community would like to show that the incidence of breast cancer is higher than in a nearby rural area. If it is found that 20 of 200 adult women in the urban community have breast cancer and 10 of 150 adult women in the rural community have breast cancer, can we conclude at the 0.01 level of significance that breast cancer is more prevalent in the urban community? (7M)

6. a) The following data pertain to the cosmic ray doses measured at various altitudes: (7M)

Altitude(feet) x	50	450	780	1200	4400	4800	5300
Count y	28	30	32	36	51	58	69

   (i) Fit an exponential curve.
   (ii) Use the result obtained in part (i) to estimate the mean does at an altitude of 3,000 feet.

   b) Explain the correlation and regression. (7M)

7. The following means and ranges, obtained in 20 successive random samples of size 5. (14M)

Sample	$\overline{X}$	R	**Sample**	$\overline{X}$	R
1	4.24	0.09	**11**	4.20	0.21
2	4.18	0.12	**12**	4.25	0.20
3	4.26	0.14	**13**	4.25	0.17
4	4.21	0.24	**14**	4.21	0.07
5	4.22	0.15	**15**	4.19	0.16
6	4.18	0.28	**16**	4.23	0.16
7	4.23	0.06	**17**	4.27	0.19
8	4.19	0.15	**18**	4.22	0.20
9	4.21	0.09	**19**	4.20	0.12
10	4.18	0.15	**20**	4.19	0.16

(i) Use these data to find the central line and control limits for an $\overline{X}$ chart.
(ii) Use these data to find the central line and control limits for an R chart.
(iii) Plot the given data on $\overline{X}$ and R charts based on the control chart constants computed in parts (i) and (ii), and interpret the results.

Note :- Statistical tables and Control Chart Constants are required

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