## B.Tech II Year I Semester (R13) Supplementary Examinations June 2017

## PROBABILITY \& STATISTICS

(Common to IT \& CSE)
Time: 3 hours
Max. Marks: 70

PART - A<br>(Compulsory Question)

1 Answer the following: ( $10 \times 02=20$ Marks)
(a) A fair die is tossed twice. Find the probability of getting a 4, 5 or 6 on the first toss and 1, 2, 3 or 4 on the second toss.
(b) State addition theorem of probability for any two events.
(c) If $f(x)=K\left(1-x^{2}\right), \quad$ for $0<x<1$
$=0, \quad$ otherwise, Find K.
(d) The probability of a man hitting a target is $1 / 4$. If he hits 7 times, find the probability of hitting the target at least twice.
(e) If $n=144$, S.D, $\sigma=4$ and the mean $=150$, then find $95 \%$ confidence interval for $\mu$.
(f) What is the significance of ANOVA?
(g) Define Type I and Type II errors.
(h) Find the finite population correction factor for $\mathrm{n}=10$ and $\mathrm{N}=100$.
(i) Define SQC.
(j) Define ( $M / M / 1$ ): $(\infty / F I F O)$ queueing system.

## PART - B

(Answer all five units, $5 \times 10=50$ Marks)

## UNIT - I

2 (a) Two aeroplanes bomb a target in succession. The probability of each correctly scoring a hit is 0.3 and 0.2 respectively. The second will bomb only if the first misses the target. Find the probability that (i) Target is hit. (ii) Both fails to score hits.
(b) Suppose 5 men out of 100 and 25 women out of 10,000 are colour blind. A colour blind person is chosen at random. What is the probability of the person being a male (Assume male and female to be in equal numbers)?

## OR

3 (a) A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number E of defective items.
(b) The probability density $f(x)$ of a continuous random variable is given by $f(x)=C e^{-|x|},-\infty<x<\infty$. Find C, mean and variance of the distribution. Also find $P(0<x<4)$.

## UNIT - II

4 (a) An oceanographer wants to check whether the depth of the ocean in a certain region is 57.4 fathoms, as had previously been recorded. What can he conclude at the 0.05 level of significance, if readings taken at 40 random locations in the given region yielded a mean of 59.1 fathoms with a standard deviation of 5.2 fathoms?
(b) A random sample of size 16 values from a normal population showed a mean of 53 and a sum of squares of deviations from the mean equals to 150 . Can this sample be regarded as taken from the population having 56 as mean. Obtain $95 \%$ confidence limits of the mean of the population.

## OR

5
The nicotine contents in milligrams in two samples of tobacco were found to be as follows:

| Sample A | 24 | 27 | 26 | 21 | 25 | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Sample B | 27 | 30 | 28 | 31 | 22 | 36 |

Can it be said that the two samples have come from the same normal population?

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## UNIT - III

7 To study the performance of three detergents and three different water temperatures, the following whiteness readings were obtained with specially designed equipment.

| Water temperature | Detergent A | Detergent B | Detergent C |
| :--- | :--- | :--- | :--- |
| Cold water | 57 | 55 | 67 |
| Warm water | 49 | 52 | 68 |
| Hot water | 54 | 46 | 58 |

Perform a two way analysis of variance using $5 \%$ level of significance. (Given $F=6.94$ )

## UNIT - IV

8 (a) What are $3 \sigma$ control limits? Explain the difference between confidence limits and control limits.
(b) The following data gives readings 10 samples of size 6 each in production of a certain component.

| 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 $\mathrm{n}=6, \mathrm{~A}_{2}=0.483$ ). What is your conclusion?

## OR

9 The following data show the values of sample mean, $(\bar{x})$ and range ( R ) for 10 samples of size 6 each. Calculate the values for central line and control limits for mean - chart and range - chart. Draw the control charts and comment on the state of control.

| Sample No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Mean $\bar{X}$ | 43 | 49 | 37 | 44 | 45 | 37 | 51 | 46 | 43 | 47 |
| Range R | 5 | 6 | 5 | 7 | 7 | 4 | 8 | 6 | 4 | 6 |

## UNIT - V

A fast food restaurant has one drive-in window. It is estimated that cars arrive according to a Poisson distribution at the rate of 2 every 5 minutes and that there is enough space to accommodate a line of 10 cars. Other arriving cars can wait outside this space, if necessary. It takes 15 minutes on the average to fill on order, but the service time actually varies according to an exponential distribution. Determine the following:
(a) The probability that the facility is idle.
(b) The expected number of customers waiting to be served.
(c) Effective arrival rate.
(d) The time a customer expects to spend in the system.

## OR

11 Discuss ( $M / M / 1$ ): $(\infty / F C F S)$ queueing model and find the expected queue length in the system.

