Code No: 821AD

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD <br> MCA I Semester Examinations, January - 2018 <br> PROBABILITY AND STATISTICS 

Time: 3hrs
Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have $\mathrm{a}, \mathrm{b}, \mathrm{c}$ as sub questions.

## PART - A

$$
5 \times 5 \text { Marks }=25
$$

1.a) $\mathrm{A}, \mathrm{B}, \mathrm{C}$ in order toss a coin. The first one to toss head wins the game. What are the probabilities of winning, assuming that the game may continue indefinitely?
b) If X is uniformly distributed in $-2 \leq \mathrm{X} \leq 2$, find $\mathrm{P}(\mathrm{X}<1)$.
c) Explain about sampling distribution.
d) Discuss the test of significance procedure.
e) Write the formula to find the rank correlation, by defining the terms involved in it.

## PART - B

$$
5 \times 10 \text { Marks }=50
$$

2.a) A can hit a target once in five shots. $B$ can hit a target twice in 3 shots. $C$ can hit a target once in 4 shots. What is the probability that 2 shots hit the target?
b) If $\mathrm{P}(\mathrm{A})=2 / 3, \mathrm{P}(\mathrm{B})=1 / 5$, prove that $0 \leq \mathrm{P}(\mathrm{A} \cap \mathrm{B}) \leq \frac{1}{5}$.

## OR

3.a) If $\mathrm{P}(\mathrm{A})=\mathrm{P}(\mathrm{B})=\mathrm{P}(\mathrm{A} \cap \mathrm{B})$, prove that $\mathrm{P}(\mathrm{A} \cap \overline{\mathrm{B}}+\overline{\mathrm{A}} \cap \mathrm{B})=0$.
b) There are three identical coins, one of which is ideal and the other two are biased with probabilities $\frac{1}{4}$ and $\frac{3}{4}$, respectively for getting a head. One coin is taken at random and tossed twice. If a head appears both the times, show that the probability that the ideal coin was chosen is equal to $\frac{2}{7}$.
4.a) Out of 800 families with 5 children each, How many would you expect to have a
i) 3 boys
ii) at least one boy
iii) either 2 or 2 boys.
b) Suppose the weights of 800 male students are normally distributed with mean 28.8 kg and standard deviation of 2.06 kg . Find the number of students whose weights are
i) between 28.4 kg and 30.4 kg
ii) more than 31.3 kg .

## OR

5. Let $X$ be a random variable such that
$\mathrm{P}(\mathrm{X}=-2)=\mathrm{P}(\mathrm{X}=-1)=\mathrm{P}(\mathrm{X}=1)=\mathrm{P}(\mathrm{X}=2)$ and $\mathrm{P}(\mathrm{X}<0)=\mathrm{P}(\mathrm{X}=0)=\mathrm{P}(\mathrm{X}>0)$
Determine the probability mass function and the distribution of $X$.
6.a) The mean voltage of a battery is 15 and standard deviation 0.2 . Find the probability that four such batteries connected in series will have a combined voltage of 60.8 or more volts.
b) Suppose the diameter of motor shafts in a lot have a mean of 0.249 inches and standard deviation if 0.003 inches. The inner dia of bearings in another lot have a mean of 0.255 inches and standard deviation of 0.002 inches. If a shaft and bearing are selected at random, find the probability that the shaft will not fit inside the bearing. Assume that both dimensions are normally distributed.

## OR

7.a) A random sample of size 81 is taken from an infinite population having the mean 65 and standard deviation 10. What is the probability that $\bar{X}$ will lie between 66 and $68 ?$
b) Determine the expected number of random samples having their means i) between 22.39 and 22.41 ii ) greater than 22.42 iii) less than 22.37 for the sampling distribution of means of 300 random samples each of size $\mathrm{n}=36$ are drawn from the population of $\mathrm{N}=1500$ which is normally distributed with mean $\mu=1500$ and $\sigma=0.048$.
8.a) The nine items of a sample had values $45,47,50,52,48,47,49,53$, and 51 . Does the mean of the nine items differ significantly from the assumed population mean of 47.57.
b) A survey of 320 families with 5 children each revealed the following distribution

| No. of boys | 5 | 4 | 3 | 2 | 1 | 0 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| No. of girls | 0 | 1 | 2 | 3 | 4 | 5 |
| No. of families | 14 | 56 | 110 | 88 | 40 | 12 |

Is this result consistent with the hypothesis that male and female births are equally. [5+5]

## OR

9.a) Discuss the properties of a good estimator.
b) A random sample of 20 fuses subjected to overload has mean time for blow of 10.63 minutes with standard deviation 2.48 minutes. What can we assert with $95 \%$ confidence about the maximum error if we use $\bar{x}=10.63$ minutes as a point estimate of true average it takes such fuses for blow when subjected to overload.
10.a) Find the parabola of the form $y=a+b x+c x^{2}$ which fits most closely with the observations

| $x$ | 2 | 4 | 6 | 8 | 10 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $y$ | 3.07 | 12.85 | 31.47 | 57.38 | 91.29 |

b) Find the curve of best fit of the type $y=a \mathrm{e}^{b x}$ to the following data by the method of least squares

| $x$ | 1 | 5 | 7 | 9 | 12 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $y$ | 10 | 15 | 12 | 15 | 21 |

## OR

11. Given that the lines of regression of $y$ on $x$ and $x$ on $y$ are respectively $y=x$ and $4 x-y=3$ and the variance of $x=3$, find:
a) Mean values of $x$ and $y$
b) Coefficient of correlation
c) Variance on $y$.
