CHANCHAL COLLEGE

ASSIGNMENT - 2021
MATHEMATICS (Honours)
Paper: MTMH - DC- 10

Full Marks : 32

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable. Notations and symbols have their usual meanings.

Group – A

Answer any four questions   1X4=4

1. (a) If T_1 and T_2 be statistic with $E(T_1) = 2\theta_1 + 3\theta_2$ and $E(T_2) = \theta_1 + \theta_2$ then find the unbiased estimate of the parameter θ_1.

(b) Write down the expression of standard deviation of sample mean for SRSWR.

(c) What is confidence interval?

(d) Find the value of k for which $\begin{aligned} f(x) &= kx(1-x), 0 < x < 1 \\ &= \quad 0 \;, otherwise \end{aligned}$

(e) Write the significance of correlation coefficients of a bivariate data.

Group-B

Answer any two questions   2X5=10

2. In a factory, machines $M_1, M_2, and\, M_3$ produce 15%, 35% and 50% respectively of the total output and they produce 3%, 5% and 6% defective items respectively. If a randomly chosen item is found to be defective, what is the probability that it came from machine M_2?

3. A point is taken at random on a line AB, of length 2a, all positions of the point being equally likely. Show that the expected value of the rectangle AP.PB = ⅔ a^2 and find the probability that the area exceeds $\frac{1}{2}a^2$.

4. Using **Chebyshev's inequality** to show that for $n \geq 36$, the probability that in n throws of a fair die the number of sixes lies between $\left(\frac{n}{6} - \sqrt{n}\right)$ and $\left(\frac{n}{6} + \sqrt{n}\right)$ is at least $\frac{31}{36}$.

5. Examine whether the **WLLN** holds good for the sequence $\{x_n\}$ of independent random variables having the distribution $P\left\{X_n = \frac{1}{\sqrt{n}}\right\} = \frac{2}{3}, P\left\{X_n = -\frac{1}{\sqrt{n}}\right\} = \frac{1}{3}$.

Group-B

<u>Answer any two questions   2X9=18</u>

7. Find the **MLE** of θ for n sample observation of the random variables X follows the probability density function $f(x) = Cx^{\theta}, 0 \le x \le 1$ where c is a constant.

8. χ_1^2 $_{and}$ χ_2^2 are two independent chi-square random variables with n_1 and n_2 degrees of freedom, then $\frac{\chi_1^2}{\chi_2^2}$ is a $\beta_2(n_1/2, n_2/2)$ random variable.

9. A set of 5 identical coins is tosse,d 320 times and the number of heads appearing each time is recorded. The results are

No. of heads:	0	1	2	3	4	5
Frequency	14	45	80	112	61	8

10. If x and y are correlated variables and $s_x = s_y$ then find $b_{x,\ x+y}$ and $b_{x+y,\ x}$ $and\ hence, show\ that\ r_{x,\ x+y} = \sqrt{\frac{1+r}{2}}$

11. Find out a $100(1-\alpha)\%$ confidence interval for mean of a normal population having known varience.