RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, DECEMBER 2019

FIRST YEAR (BATCH 2019-22)

STATISTICS (General)

Paper : I

Date : 16/12/2019

Time : 11 am – 1 pm

Full Marks : 50

[Use a separate Answer Book for each Group]

Group – A

Answer any three questions from question no. 1 to 6: [3×5]

1. Prove that the absolute difference between mean and median cannot exceed the standard deviation. [5]
2. If $\bar{X}$ is the mean of X_1, X_2, X_3 and x_1, x_2 and x_3 are the deviations of X_1, X_2, X_3 from $\bar{X}$ respectively, then prove that $x_1^2+x_2^2+x_3^2=X_1^2+X_2^2+X_3^2-3\bar{X}^2$. [5]
3. For two observations only, prove $\frac{AM}{GM}=\frac{GM}{HM}$. [5]
4. Write a short note on Histogram or Ogive. [5]
5. Derive the expression of standard error of estimate of *y* from its linear regression on *x*. [5]
6. Show that $b_2 > b_1 + 1$ where notations have their usual meaning. [5]

Answer any one question from question no. 7 to 8: [1×10]

7. For *n* observation show that $AM \geq GM \geq HM$. [10]
8. For a set of *n* observations show that $\frac{R^2}{2n} < s^2 < \frac{R^2}{4}$ where *R* is the range and *s* is the standard deviation of the observations. [10]

Group – B

Answer any three questions from question no. 9 to 14: [3×5]

9. If the letters of the word RAMESH are arranged at random, what is the probability that there are exactly 3 letters between A & E? [5]
10. State the axiomatic definition of probability. Derive the classical defination of probability from the axiomatic definition. [3+2]
11. For events A_1, A_2, ..., A_n, show $P\left(\bigcap_{i=1}^{n} A_i\right) \geq \sum_{i=1}^{n} P(A_i) - (n-1)$. [5]
12. There are two events A & B such that P(A)>0 and P(B)>0 prove that (i) A & B cannot be independent if they are mutually exclusive (ii) A & B cannot be mutually exclusive if they are independent. [3+2]
13. A & B alternatively toss a fair coin. The first one to throw a head wins. If A starts, find the probability of B's winning. [5]
14. Four different letters are to be put in four addressed envelopes. Find the probability that no letter goes to the correct envelope. [5]

Answer any one question from question no. 15 to 16: [1×10]

15. (i) An urn contains 'a' white & 'b' black balls. A ball is drawn at random from the urn, it is replaced and more over 'c' balls of the colour drawn are added to the urn. Then a second ball is drawn at random from the urn. What is the probability that it's white? [5]

(ii) Derive exponential distribution from Poisson distribution. [5]

16. (i) Prove the product law of expectation in case of the joint distribution of two independent discrete random variables.

(ii) For random variable X, show that $\left[E(X^2)\right]^{\frac{1}{2}} \geq E(X)$.

(iii) A continuous random variable X has a pab $f(x) = 3x^2, \leq 0 \leq x \leq 1$. Find a such that $P\left[X \leq a\right] = P\left[X > a\right]$.

(iv) State the Weak law of large numbers. [2+2+3+3]

———— × ————