RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, DECEMBER 2017

FIRST YEAR (BATCH 2017-20)

Date : 20/12/2017 **STATISTICS (General)**

Time : 11 am – 1 pm Paper : I Full Marks : 50

[Use a separate Answer Book for each Group]

Group – A

Answer any three questions from Question Nos. 1 to 6 : [3×5]

1. Write a short note on Bar diagram.
2. Prove that mean square deviation is least when taken about arithmetic mean.
3. Find the mean of squares of the values 1, 3, 5, ..., (2n –1). If two variables are related as xy = 2, find the relation between harmonic mean of x and arithmetic mean of y.
4. Show that $\frac{R^2}{2n} \le s^2 \le \frac{R^2}{4}$ where R is the range and s is the standard deviation of n observations.
5. What do you mean by skewness? Briefly explain different measures of skewness.
6. Distinguish between—
   a) Primary and Secondary data.
   b) Frequency and Non frequency data.

Answer any any question from Question Nos. 7 & 8 : [1×10]

7. Define Correlation coefficient. Prove that its value lies between –1 and +1. Interpret if its value becomes 0. What are the limitations of correlation coefficient? [2+4+1+3]
8. Why two regression lines are necessary? How will you identify two regression lines? Find the angle between two regression lines and interpret $r = \pm 1$. [2+3+4+1]

Group – B

Answer any three questions from Question Nos. 9 to 14 : [3×5]

9. Show that the probability that exactly one of the events A & B occurs is $P(A) + P(B) - 2P(A \cap B)$.
10. A secretary writes four letters and the corresponding addresses on envelopes. If he inserts the letters in the envelopes at random irrespective of address, then calculate the probability that all letters are wrongly placed.
11. A die is thrown twice, the sample space S consists of the 36 possible pairs of outcome (a, b), each assigned with probability $\frac{1}{36}$. Let A, B, C denote the events.

    $A \equiv \{(a,b) \mid a \text{ is odd}\}$; $B \equiv \{(a,b) \mid b \text{ is odd}\}$; $C \equiv \{(a,b) \mid a+b \text{ is odd}\}$

    Check if A, B & C are independent or independents in pairs only.
12. A room has 3 lamp-sockets. From a collection of 10 bulbs of which 6 are bad, a person selects 3 at random and puts them in the sockets. What's the probability that there'll be light.
13. Derive the classical definition of probability from the axiomatic definition.
14. In a bernoullian sequence of n trials with probability of success p, find the probability that i^{th} success occurs at n^{th} trial.

Answer <u>any any</u> question from <u>Question Nos. 15 & 16</u> : [1×10]

15. a) Give the cumulative distribution function below, find the corresponding probability mass function

$$F(x)=\begin{cases}0 & ; \quad -\infty < x < 0\\ 1/5 & ; \quad 0 \le x < 1\\ 3/5 & ; \quad 1 \le x < 3\\ 1 & ; \quad x \ge 3\end{cases}.$$ [5]

b) Determine the value of the constant C such that f(x) defined by

$$f(x)=\begin{cases}Cx(1-x) & ; \quad 0 < x < 1\\ 0 & ; \quad \text{elsewhere}\end{cases}$$ is a p.d.f. Then find $P\left(x > 1/3\right)$. [5]

16. a) The population of Cyprus is 75% Greek, 25% Turkish. 20% of the Greeks & 10% of the Turks speak English. A visitor to the town meets someone who speaks English. What's the probability that he is a Greek? [5]

b) The radius X of a circle has uniform distribution in (1, 2). Find the mean & variance of the area of the circle. [2+3]

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