RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, DECEMBER 2016

FIRST YEAR [BATCH 2016-19]

Date : 17/12/2016 **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: [3×5]

1. For *n* observations show that $AM \geq GM \geq H.M$. [5]
2. Derive the formula of median in case of frequency distribution. [5]
3. Prove that mean deviation about median is the least. [5]
4. Show that absolute difference between mean and median can not exceed standard deviation. [5]
5. What do you mean by coefficient of determination? Why is it called so? [5]
6. Write a short note on Histogram or ogive. [5]

Answer ***any one*** question: [1×10]

7. What do you mean by skewness? Explain different measures of skewness.
   Prove that $b_2 \geq b_1 + 1$; notations have their usual meaning. [(2+4)+4]
8. Out of two regression given by $x + 2y = 5$ and $2x + 3y - 8 = 0$ which one is the regression line of x on y? Determine the means of x and y. Also determine the correlation coefficient and ratio of variances of variables x and y. Calculate the value of y when $x = 12$. [2+2+3+2+1]

Group – B

(*Answer any three questions*) [3×5]

9. If three members are drawn randomly from first 30 natural numbers, find the probability that the numbers drawn are in A.P. [5]
10. An integer X is selected at random from the first 50 natural numbers. Calculate $P\left(X + \frac{96}{X} > 50 \right)$. [5]
11. There are three boxes, numbered I, II & III. Box-I contains 3 Red & 1 blue balls, Box-II contains 3 blue & 1 red balls and Box-III contains 2 red & 2 blue balls. One box is chosen at random and one ball is drawn at random from it. If it's given that the ball drawn is red, what is the probability that it came from Box-I? [5]
12. If the events $E_1, E_2, \ldots, E_n$ are independent and such that $P(E_i^c) = \frac{i}{i+1}$; $i = 1, 2, \cdots, n$, then find the probability that at least one of the n events occurs. [5]
13. (i) For any two events A and B, show that
    $$\max\{P(A), P(B)\} \leq P(A \cup B) \leq \min\{P(A) + P(B), 1\}.$$
    (ii) A & B are two events such that $P(A) = \frac{3}{4}$, $P(B^c) = \frac{3}{8}$, prove that $\frac{3}{8} \leq P(A \cap B) \leq \frac{5}{8}$. [3+2]

14. X denotes the numbers of heads & Y the number of tails obtained in three tosses of a fair coin. If $Z = X - Y$, write down the probability distribution of Z and find $E(Z)$. [5]

Answer ***any one*** question: [1×10]

15. (i) For what value of 'a'

$$\left.\begin{aligned} f(x) &= a\left(\frac{1}{2}\right)^x ;\ x = 0,1,2,\cdots \\ &= 0 \qquad ;\ \textit{elsewhere} \end{aligned}\right\}$$

is the probability mass function of a random variable X? Find $P\left(X > 0 / X < 2\right)$. [2+3]

(ii) A discrete random variable X has the following distribution function: [1+1+1+1+1]

$$F(x) = \begin{cases} 0 & ;\ x < -1 \\ \frac{1}{4} & ;\ -1 \le x < 1 \\ \frac{1}{2} & ;\ 1 \le x < 3 \\ \frac{3}{4} & ;\ 3 \le x < 5 \\ 1 & ;\ x \ge 5 \end{cases}$$

Find (a) $P(X \le 3)$ (b) $P(X = 3)$ (c) $P(X < 3)$ (d) $P(-0.4 < X < 4)$ (e) $P(X = 5)$

16. (i) Four shoes are randomly selected from 12 pairs of shoes. Find the probability that among the selected shoes there will be exactly one complete pair. [5]

(ii) The distribution of a discrete random variable X is given by

$P[X = -1] = P[X = 0] = P[X = 1] = \frac{1}{4}$; $P[X = -2] = \frac{1}{16}$, $P(X = 2) = \frac{3}{16}$. Find mode & median of X. [1+4]

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