RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, MARCH 2021

FIRST YEAR (BATCH 2020-23)

Date : 30/03/2021 **STATISTICS (GENERAL)**

Time : 11 am – 2 pm **Paper : I** Full Marks : 75

Unit – I (Theory)

Group – A

***Answer <u>any five</u> questions from question nos. 1 to 6*:** [5×5]

1. Find the mean deviation from the mean and standard deviation of A.P. a, (a+d), (a+2d),....., (a+2nd) and verify that the latter is greater than the former. [5]

2. Find the minimum value of: [5]

$$f(x) = (x-6)^2 + (x+3)^2 + (x-8)^2 + (x+4)^2 + (x-3)^2$$

$$g(x) = |x-6| + |x+3| + |x-8| + |x+4| + |x-3|$$

3. Show that, if the variable takes the values 0, 1, 2, ..., n with frequencies proportional to the binomial coefficients ${}^nC_0$, ${}^nC_1$, ${}^nC_n$ respectively then the mean of the distribution is n/2, the mean square deviation about zero is $\frac{n(n+1)}{4}$ and the variance is $\frac{n}{4}$. [5]

4. The first three moments about the origin are given by

$$m_1' = \frac{n+1}{2},\ m_2' = \frac{(n+1)(2n+1)}{6} \quad \text{and} \quad m_3' = \frac{n(9n+1)}{4}$$

Examine the skewness of the data. [5]

5. Let x and y be uncorrelated variables with standard deviation S_1 and S_2. Show that the correlation coefficient between x and (x+y) is $\frac{S_1}{\sqrt{S_1^2 + S_2^2}}$ [5]

6. In a three variate multiple correlation analysis, the following results were found:

$\overline{x_1} = 60$ $\overline{x_2} = 70$ $\overline{x_3} = 100$

$s_1 = 3$ $s_2 = 4$ $s_3 = 5$

$r_{12} = 0.7$ $r_{13} = 0.6$ $r_{23} = 0.4$

The symbols having their usual significance. Find the regression of x_1 on x_2 and x_3 and the multiple correlation coefficient $R_{1.23}$ [5]

Unit – I (Theory)

Group – B

***Answer <u>any five</u> questions from question nos. 7 to 12*:** [5×5]

7. If the letters of the word R A M E S H be arranged at random, what is the probability that there are exactly 3 letters between A & E? [5]

8. An integer X is chosen at random from the first 50 natural numbers. Calculate Probability of $\left(X+\frac{96}{x}>50\right)$ [5]

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

10. Examine if the following is a cumulative distribution function : [5]

$$F(x)=\begin{cases}0 & ;if\ \ x\le 1\\ 1-\frac{1}{2x} & if\ \ x>1\end{cases}$$

11. What are the drawbacks of classical definition of probability? How are some of these overcome in the frequency definition of probability? [5]

12. The probability of no matches when n letters are randomly placed in n envelops is e^{-1} (approximately) when n is large. This value resembles the probability that a random variable X takes value 0, where $X \sim poi(\lambda=1)$. Can you explain the reason behind this coincidence? [5]

Unit – II (Practical)

Group – C

***Answer <u>any three</u> questions from question nos. 13 to 16*:** [3×5]

13. A summary of the estimated receipts and expenditures of Government of India for a particular year, is given below:

Receipts	Millions of Rupees	Expenditure	Millions of Rupees
Direct taxes on income	2076.0	Interest on public debt	1143.3
Customs duties	1680.0	Education and Health	272.6
Other taxes	2955.6	National defence	2774.5
Revenue from public undertakings	1660.7	Transfers to states	3755.3
Other receipts	1189.1	Other current expenditures	1754.4
		Capital expenditures	5702.2
		Other loans and advances	759.8
Total	9561.4	Total	16162.1

Draw suitable diagrams to show the relative importance of different heads of income and expenditure. [5]

14. Obtain the equation of the line of regression of yield of rice (y) on water (x) from the data given in the following table:

Water in Inches (x)	12	18	24	30	36	42	48
Yield in Tons (y)	5.27	5.68	6.25	7.21	8.02	8.71	8.42

Estimate the most probable yield of rice for 40 inches of water. [5]

15. For two values, say a and b (a<b), of a variable x the mean and standard deviation are respectively 25 and 4, Find a and b. [5]

16. The first two moments of a distribution about 5 are 3, 25 respectively. If mode=6, obtain pearson co-efficient of skewness and coefficient of variance (C.V). [5]

Unit – II (Practical)
Group – D

***Answer <u>any one</u> question from question nos. 17 & 18*:** [1×10]

17. Fit a binomial distribution to the following data on the number of heads(x) obtained in tossing of 4 coins when 4 coins are tossed simultaneously: [The below data pertains to 100 repetitions of the tossing of 4 coins] [10]

X	0	1	2	3	4	Total
Frequency	7	24	34	29	6	100

18. A customer service department keeps records of customers arrived to make complaint. Let X be the number of customers arrived per day for making complaints about their service. The record for 90 days is as follows

X	0	1	2	3	Total
No. of days	54	26	8	2	90

Fit a Poisson distribution to the above data. [10]

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