



বিদ্যাসাগর বিশ্ববিদ্যালয়

VIDYASAGAR UNIVERSITY

MLISC. Examinations 2020

Semester II

Subject: Master of Library and Information Science

Paper: MLI-208

(Theory)

Full Marks: 40

Time: 2HRS.

Candidates are required to give their answers in their own words as far as practicable.

Answer any one question from following questions:

- 1 Considering 'X' as a discrete random variable prove, $AM \geq GM \geq HM$. Distinguish between the following pairs: discrete variable and continuous variable; dependent variable and independent variable.

Given the following set of values with frequencies: Calculate Arithmetic Mean and Standard Deviation

X	f
50	10
55	12
60	18
65	22
70	30
75	28
80	21
85	17
90	11
95	6
100	3
105	1



- 2 Define and explain Product-Moment Correlation Coefficient and Rank Correlation Coefficient. Show that their values lie between +1 and -1. Marks obtained by 15 students in physics (x) and mathematics (y) are as follows:

x	45	50	66	95	92	87	75	79	84	55	68	77	76	88	81
y	59	55	85	79	85	81	87	71	86	63	65	73	86	83	94

Find out Correlation Coefficient between x and y and interpret the result.

- 3 Explain the concepts of linear regression and non-linear regression. Show that the Correlation Coefficient between two discrete random variables x and y is equal to the Geometric Mean of b_{yx} and b_{xy} , where b_{yx} indicates Regression Coefficient of y on x and vice versa. Explain with example, how exponential growth model may be solved by linear regression method.
- 4 Derive the expression for Rank Correlation Coefficient. Suppose 15 journals are ranked by h-index and Impact Factor. Find out Rank Correlation Coefficient and interpret the result.

S. No.	Rank by h-index	Rank by Impact Factor
1	1	3
2	2	2
3	3	8
4	4	6
5	5	7
6	6	9
7	7	10
8	8	1
9	9	4
10	10	5
11	11	11
12	12	12
13	13	15
14	14	14
15	15	13

- 5 Define Median and Mode. In a subject, the relationship between number of authors and number of contributing papers are given below: Find out Lotka's constants by applying linear regression analysis, also interpret the result:

S. No.	No. of contributing authors	No. of papers contributed
1	1	125



2	1	106
3	1	95
4	2	75
5	2	67
6	3	55
7	3	41
8	4	25
9	5	18
10	15	16
11	19	12
12	27	8
13	33	7
14	45	6
15	45	5
16	50	4
17	65	3
18	185	2
19	365	1

6 Apply Principle of Least Squares to fit a straight line $y = a + bx$, to the following data:

x	2	4	6	8	10	12	14	16	18	20
y	10	14	15	16	15	17	18	20	23	27

Discuss different types of non-linear equations and explain how they can be transformed into linear equation.

7 Explain the following: a) Mean deviation; b) Root-Mean-Square deviation; c) Standard deviation; d) Variance. Show that the variance of a set of observations will be equal to the



difference between the squares of the averages and the average of the squares.

Find the Standard Deviation and variance for the distribution given below:

x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Frequency	10	20	32	41	53	65	87	99	92	81	67	51	29	11	5

8 a) Prove that the Standard Deviation is independent of any change of origin, but is dependent on the change of scale.

b) Prove that the Standard Deviation calculated from two values 'a' and 'b' of a variable 'y' is equal to half of their difference.

c) Show that if x_{av} is the arithmetic mean of the quantities $x_1, x_2, x_3 \dots \dots x_n$, then,

$$\sum_{i=1}^n (x_i - x_{av})^2 = \sum_{i=1}^n x_i^2 - nx_{av}^2$$

9 (a) Prove that the correlation coefficient does not depend on the origin or scale of the observations. Discuss various uses and limitations of correlation coefficient in library and information systems and services.

(b) If two variables are independent, their correlation coefficient is zero. Is the converse true? Explain by means of an example.

10 If three uncorrelated variables x_1, x_2 and x_3 have the same standard deviation, find out the correlation coefficient between $(x_1 + x_2)$ and $(x_2 + x_3)$.

Two lines of regression are given by: $x - 2y = 5$ and $2x + 3y = 8$ and $\sigma_x^2 = 12$. Calculate the values of x_{av}, y_{av}, σ_y and r .

11 Explain with examples, in which areas of library services, the concept of "Measures of dispersion" and "Regression analysis" may be applied.

Consider the statement, "The larger the sample, the better will be the result". Explain why this statement might be misleading to a novice researcher.

Does increasing sample size will reduce bias or increase precision? Justify your answer.

12 What is probability? Give examples. Define how the unit of 'Information' (bit) may be obtained from the concept of probability. Explain the concept of 'Information entropy'.

Discuss how Ranganathan utilized the concept of 'Infinity (∞)' and 'Infinitesimal ($\frac{1}{\infty}$)' in developing the concept of 'Subject' in the context of theory of classification.