Indian Statistical Institute

Documentation Research and Training Centre

M.S. in Library and Information Science

Semester II, Mid-Term Exam (AY 2025-26)

Paper – 09: Elements of Mathematics and Statistics

Date: 25.02.2026 **Max. Marks**: 40

Time: 1hr 30 minutes

INSTRUCTION: Read the question before you attempt.

PART A: Answer all *five* questions.

1) Answer all the following questions. [5X2]

a) Determine whether the following relation is reflexive, symmetric, and transitive:
Relation **R** in the set **Z** of all integers is defined as **R** = {(x, y): x − y is an integer}.

b) Define the Measures of Central Tendency and Measures of Dispersion with example of one equation each.

c) Let f: **R** → **R** be defined as $f(x) = 3x$. Choose the correct answer and explain why:
   i. f is one one and onto
   ii. f is many one onto
   iii. f is one one but not onto
   iv. f is neither one one nor onto.

d) Draw the less-than ogive curve for the following data and estimate the measure of central tendency (Median).

Daily Income	0-100	100-200	200-300	300-400	400-500
Number of workers	7	3	5	3	7

e) Consider the set A = {1, 2, 3} and **R** be the smallest equivalence relation on A, find **R**. $R = \{(1,1), (2,2), (3,3)\}$

PART B: Answer any *three* questions.

1) The number of citations received by 13 articles authored by a researcher is given below: [5+5]
Citation Counts: 5500, 5050, 4225, 2775, 1254, 985, 5050, 5995, 6492, 6775, 7225, 8595, 7980
Using a suitable quartile method, answer the following:

a) Define the Interquartile Range (IQR). Calculate IQR and identify outliers (if any) using the IQR rule.
b) Draw a box plot for the given dataset and interpret the graph.

2) a) Give an example of a relation. Which is [2.5X2]
i. Reflexive and transitive but not symmetric.
ii. Transitive but neither reflexive nor symmetric.

b) Consider f: **R** → **R** given by $f(x) = 4x + 3$. Show that f is invertible. Find the inverse of f. $f^{-1}(y) = \frac{y-3}{4}$ [5]

3)

a) Write the set {x : x is a positive integer and $x^2 < 40$} in the roster form. $\{1,2,3,4,5,6\}$ [2]

b) In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, and 3 read all three newspapers. Find: [4+4]
i. The number of people who read at least one of the newspapers. = 52
ii. The number of people who read exactly one newspaper. = 30

4) For the following frequency distribution: [5+3+2]

Classes	0-10	10-20	20-30	30-40	40-50
Frequencies	5	8	15	16	6

a) Find the Mean, Median, and Mode, and plot the frequency distribution graph, clearly locating the three measures of central tendency. 5 (4m)

b) Calculate the Variance of the data. 3

c) Draw and label the following distributions, showing the three measures of central tendency in each case:

   i. Positively skewed distribution 2
   ii. Negatively skewed distribution
   iii. Symmetrical distribution