SARASWAT EDUCATION SOCIETY's

Sridora Caculo College of Commerce & Management Studies, Mapusa Goa

BCA SEMESTER I END EXAMINATION, OCTOBER/NOVEMBER 2026

MAT-112 ELEMENTARY STATISTICS

DURATION: 02 Hours **MAX. MARKS: 80**

Instructions:

1. *All questions are compulsory unless a choice is specifically indicated.*
2. *Figures to the right indicate full marks.*
3. *Use of scientific non-programmable calculators is allowed.*

Q.1 **Answer *each* of the following:** **$4 \times 4 = 16$**

(i) **Choose the correct alternative.**

1. The difference between the maximum and minimum values in a data set is called the?

   a) Mean b) Range c) Frequency d) Variance

2. Which of the following cannot be the probability of an event?

   a) $\frac{1}{2}$ b) 0 c) -0.5 d) 1

3. Two events A and B are said to be exhaustive if

   a) $A \cup B = S$ b) $A \cap B = \emptyset$

   c) $P(A) = P(B)$ d) $P(A \cap B) = 1$

4. If a fair coin is tossed twice, the total number of outcomes in the sample space is

   a) 2 b) 4 c) 6 d) 8

(ii) The following observations represent the number of hours spent studying by 10 students in a week:

5, 6, 4, 8, 7, 5, 9, 6, 5, 7

Find the mean, mode and median of this data.

(iii) Distinguish between primary and secondary data, giving one suitable example for each. What are continuous and discrete variables?

(iv) What is meant by statistical quality control? Explain the terms control limits and tolerance limits in the context of a control chart.

Q.2 Answer any FOUR of the following: **$4 \times 4 = 16$**

(i) Define conditional probability. If

$$P(X) = 0.5, \quad P(Y) = 0.4, \quad P(X \cup Y) = 0.7,$$

find

$$P(X \cap Y), \quad P(X \mid Y) \text{ and } P(Y \mid X).$$

Are X and Y independent? Justify.

(ii) Explain the concept of Quota sampling and consecutive sampling. State any two advantages of purposive sampling.

(iii) In a class of 80 students, 45 study Physics, 40 study Chemistry and 20 study both. Find the probability that a randomly selected student studies:

i. Physics or Chemistry;

ii. neither Physics nor Chemistry;

iii. Chemistry given that the student studies Physics.

(iv) Explain the concept of regression. State any three important properties of regression coefficients.

(v) State and Prove the Addition Theorem of Probability for two general events.

(vi) The following data represent the daily wages (in Rs) of 80 workers. Find the median wage.

Wages (Rs)	Number of Workers
0–100	5
100–200	10
200–300	18
300–400	22
400–500	15
500–600	8
600–700	2

Q.3 Answer any TWO of the following: **$8 \times 2 = 16$**

(i) The following table gives the distribution of ages of individuals in a locality. Find the mean age by completing the given table using the Assumed-Mean method, taking the assumed mean class as 40–60.

Class Interval	f_i	x_i	$d_i = x_i - a$	$f_i d_i$
0–20	5			
20–40	12			
40–60	15			
60–80	10			
80–100	8			

(ii) The ranks obtained by 10 applicants in technical and HR interviews are given below:

Applicant	1	2	3	4	5	6	7	8	9	10
Technical	3	5	1	9	6	10	8	2	7	4
HR	4	3	2	8	7	9	6	1	10	5

Calculate Spearman's rank correlation coefficient and interpret the result.

(iii) The joint observations on variables X and Y are:

X	1	3	5	7	9	11
Y	4	6	8	12	14	16

1. Calculate Karl Pearson's coefficient of correlation.
2. Obtain the regression equation of Y on X.
3. Estimate Y when $X = 13$.

Q.4. [A] Answer any ONE of the following: **8**

(i) A bag contains 4 black, 6 white and 5 red balls. Two balls are drawn successively without replacement.

(a) Find the probability that both balls are of the same colour.

(b) Find the probability that the second ball is white given that the first ball is black.

(c) Find the probability that at least one ball is black.

(d) Explain whether the events "first ball is black" and "second ball is black" are independent.

(ii) Three machines A, B, C produce 40%, 35% and 25% of the total production of a factory respectively. Their defective rates are 3%, 4% and 5% respectively.

(a) Find the probability that a randomly selected item is defective.

(b) Given that an item is defective, find the probability that it was produced by Machine B.

(c) Find the probability that a randomly selected non-defective item was produced by Machine A.

Q.4. [B] **A manufacturer inspects 100 units from each of 8 successive samples.** 8

The number of defectives found are:

6, 7, 5, 9, 9, 4, 3, 8

i. Determine the control limits for the *p-chart*.

ii. State whether the process appears to be under statistical control.

iii. If the fifth sample had instead contained 15 defectives, explain what effect this would have on your conclusion.

Q.5 **Attempt each of the following.** **8 × 2 = 16**

(i) A disease affects 1% of a population. A diagnostic test correctly identifies a diseased person with probability 0.98, while it incorrectly gives a positive result for a healthy person with probability 0.05. A randomly selected person tests positive.

(a) Using Bayes' theorem, calculate the probability that the person actually has the disease.

(b) Explain why a highly accurate test can still produce a relatively low probability that a randomly selected person with a positive result actually has the disease.

(c) Identify the role played by the prior probability in this problem.

(ii) Draw a histogram and find the Mode for the following grouped frequency distribution. State the empirical relation between mean, median, and mode.

Class	Frequency
0–10	4
10–20	10
20–30	16
30–40	24
40–50	15
50–60	9
60–70	2

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