

EXAMINER'S REPORT

LEVEL I EXAMINATION - JULY 2025

(102) BUSINESS MATHEMATICS & STATISTICS

SECTION A

Question No. 01

This section consists of 10 multiple choice questions from question numbers 1.1 to 1.10. It is expected to write the number of the correct answer in the answer booklet from the given 4 options. In general, each candidate answered all 10 objective questions. Overall, the candidates' performance was at a moderate level.

The following are some of the common errors / weaknesses identified with the answers given by the candidates for each sub-section:

- 1.1 This question requires finding the factors of a quadratic expression in algebra. Many candidates successfully answered correctly. Candidates should be more interested in acquiring the knowledge of factorization, which is required in many cases in mathematics.
- 1.2 This is a simple interest problem that comes under the Financial Mathematics section. This problem was expected to calculate the total interest using the $S = X(1 + nr)$ formula or $z = \frac{ptr}{100}$ the simple interest formula. A significant number of candidates had provided correct answers. Some candidates had incorrectly substituted values into the formula or had given unsuccessful answers by substituting values into the wrong formula. Some candidates had failed due to errors in trivialization.
- 1.3 The statistical section expected to calculate the correlation coefficient between two variables correctly. The correlation coefficient was expected to be obtained by correctly substituting $(r) = \frac{[n\sum xy - \sum x \sum y]}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$ formula and trivializing it and obtainr. A significant number of candidates answered this question successfully.

Some candidates had not correctly substituted the values into the formula, and candidates should be more careful to correctly trivialize a long expression.
- 1.4 This is a problem related to the price relative in the section of index number in financial mathematics. Considering 2020 as the base year, the price relative of the C vehicle brand should be obtained by substituting figures into $\frac{p_1}{p_0} \times 100$ formula.

A large number of candidates had successfully answered this question, which was a very easy problem. Some candidates made mistakes such as not taking the base year correctly, not substituting values properly into the formula, and not trivializing correctly.

1.5 This is a question related to compound interest in financial mathematics. A significant number of candidates had solved the problem using the formula $s = X \left(1 + \frac{r}{n}\right)^{nt}$ and provided the correct answer. Some candidates had provided unsuccessful answers due to not choosing the correct formula, making incorrect substitutions, and making errors in trivialization.

1.6 This is a question about the independent events in probability. It was expected that students should understand that if two events, A and B, are independent, then they must satisfy $P(A \cap B) = P(A) \cdot P(B)$.

But, some candidates had incorrectly substituted $P(A \cap B) = P(A) + P(B)$. Some candidates had also taken $P(A) - P(B)$. If students understand the basic principles of probability, such problems can be easily answered. An average number of candidates had provided the correct answer.

1.7 This question required the calculation of the expected value of a given probability distribution. It was observed that many candidates did not understand the question correctly. Only a small number of candidates provided the correct answer. Some candidates had obtained the wrong answer by adding all the given probability values.

Some candidates were unsuccessful due to incorrect substitutions in the formula, multiplication by zero, misinterpretation of the obtained result, and errors in trivialization.

1.8 It was expected to determine the median and using the given frequency distribution. A significant number of candidates obtained the correct answer by substituting the correct values into the formula $Md = L_1 \left(\frac{\frac{n}{2} - Fc}{fm} \right) C$ and trivializing appropriately.

Here, some candidates considered 70 instead of $L_1 = 69.5$. It was also particularly noticeable that the class size was substituted as 9 instead of 10.

1.9 This is a problem related to compound interest in the financial mathematics section. It is expected to obtain the total amount payable at the end of 3 years using the formula $S = X(1 + r)^n$, and the total interest by deducting the initial loan amount of Rs. 80,000 from it. Majority of candidates had given the correct answer. Some candidates had not made the correct substitution to the correct formula. Also, some candidates were unsuccessful due to errors in trivialization.

1.10 This is a problem related to time series in statistical science. Here, candidates are expected to obtain the forecasted sales value by multiplying the seasonal index for the 4th quarter by the trend value. Many candidates successfully provided the correct answer.

1.11 The candidates were expected to select the appropriate explanations on the right-hand side for the terms given on the left-hand side—(A) Compound Interest, (B) Variance, and (C) Mean—and write them correctly in front of the corresponding English letters. Many candidates had answered this question very successfully.

1.12 This is a problem from basic mathematics that involves calculating the selling price by marking up the profit. Majority of candidates provided the correct answer.

1.13 This is a sum related to index numbers, in the financial mathematics section. Given the prices and quantities of three items, **A**, **B**, and **C** for the years 2023 and 2024 in a table and considering 2023 as the base year, the question was asked to calculate Paasche's Price Index (Current Weighted Aggregative Price Index) for the year 2024.

Few candidates had provided correct answer by using the relevant correct formula of Paasche's Price Index $\frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$. It was observed that majority of candidates had substituted values into an incorrect formula, calculated $\frac{\sum p_1 q_1}{\sum p_0 q_1}$, and wrote that answer instead of multiplying by 100 to obtain the price index. Mistakes were also made in multiplication and division.

Questions **1.14** and **1.15** contained two statements related to time series. Candidates were asked to determine whether each of these statements was true or false.

1.14 Many candidates stated that the statement "Seasonal variation is a repetitive periodic fluctuation" is true.

1.15 "The trend equation of a company's quarterly profits is given as, where "t" is the time in quarters. A manager in this company claims that the profit increases by Rs.250/- every quarter according to the above trend equation". This was stated to be true by majority of candidates, who provided the correct answer.

Section B

Question No. 02

(a) This question is related to ratios in financial mathematics. It was observed that the candidates' knowledge of ratios was limited.

Only a minority of candidates answered this question correctly. Accordingly, it is very important for students to practice and come to the examination well prepared for such problems.

(b) It was expected that the candidates would read the given statement carefully, prepare simultaneous equations based on that statement, and solve those simultaneous equations. Some candidates did not have the knowledge of constructing simultaneous equations by taking 2 variables, and another group did not have any understanding in solving such an equation.

Majority of candidates had successfully obtained full marks.

(c) It is a problem related to arithmetic progression. It was expected to find the first term "a" and the common difference "d," and then obtain the 10th term using the appropriate formula $T_n = a + (n - 1)d$. Majority of the candidates had given the correct answer. Some candidates were unable to obtain full marks due to errors such as using geometric progression formulas, incorrectly calculating the common difference, and taking the sum of the first "n" terms of an arithmetic progression.

Question No. 03

- (a) This is a problem related to the uses of differentiation in financial mathematics.

It was asked to identify the total revenue function and marginal cost function given the demand function $p = 24q - 3$, and the total cost function $(TC) = 1800 - 6q + 24q^2$ of a product. Considerable number of candidates have obtained $24q^2 - 3q$ by identifying $TR = P \cdot Q$ correctly. Some candidates were incorrectly shown as $TR = 24 \cdot 3 \cdot q$. It was observed that the candidates had not understood that the marginal cost can be obtained by differentiating dtC/dq the total cost function with respect to q .

- (b) It was expected to identify the break-even quantity by equalling $TC = TR$. Some candidates had taken incorrect answers by solving $MC = MR$. Also, some candidates had failed to find “q” by removing $24q^2$ from $1800 - 6q + 24q^2 = 24q^2 - 3q$. Majority of candidates solved this problem and calculated the break-even quantity correctly.
- (c) It was observed that only a minority of candidates knew that the break-even quantity of the product should be substituted into the demand function to calculate the selling price per unit at the break-even quantity. Many candidates did not find the price per unit.

Question No. 04

- (a) It was expected to identify the least squares regression line $y = a + bx$ to represent the relationship between the maintenance expenses and age of the vehicle by using the table of Ages of motor vehicles (x) and their maintenance expenses (y). An average number of candidates correctly calculated $b = \frac{[n \sum xy - \sum x \sum y]}{[n \sum x^2 - (\sum x)^2]}$ and $a = \bar{y} - b\bar{x}$ and scored 7 marks for this section.

Some candidates had misunderstood the sum and tried to draw a graph between x and y. Some candidates had not correctly calculated $\sum xy, \sum x, \sum y, \sum x^2, \sum y^2$. Some candidates had substituted $n=8$ instead of $n=7$. Although the value of b was obtained as -2.71, the value of b was incorrectly taken as 2.71 to the formula $a = \bar{y} - b\bar{x}$ and calculated value of “a” incorrectly. Some candidates had failed to take $\bar{y} = \frac{\sum y}{7}, \bar{x} = \frac{\sum x}{7}$ when finding the value of “a”.

- (b) Here, $x = 12$ must be applied to the formula obtained in part (a), $y = a + bx$, and the result multiplied by 1,000 to find the value of y. However, only a minority of candidates had done so.

Question No. 05

- (a) It was expected to calculate the mode, mean and standard deviation of the given grouped frequency distribution.

This section is expected to calculate the mode value of weekly study hours using the given data. About half of the candidates used the $Mo = L_1 + \left(\frac{\Delta_1}{\Delta_1 + \Delta_2} \right) \times C$ formula to find the mode and provided the correct answers. Some candidates failed to calculate the mode correctly even though they used the correct formula, as they did not substitute the values of L_1, Δ_1, Δ_2 and C correctly. Although the lower limit of the mode class (L_1) should have been taken as 29.5, a significant number of candidates incorrectly took it as 30.

- (b) Majority of candidates used the $\frac{\sum fx}{\sum f}$ formula and provided the correct answer and obtained the full marks. A minority of candidates were unable to calculate the mean correctly due to the following errors

- (1) Not calculating the middle value of the class intervals correctly.
- (2) Not taking the total of $\sum fx$ correctly
- (3) Not copying the values of f correctly into the answer sheet.

- (c) Only a minority of candidates calculated the standard deviation correctly using the formula

$$\sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2} \cdot \sqrt{\frac{\sum f(x-\bar{x})^2}{\sum x}}$$

Many candidates failed to find the standard deviation correctly due to the following errors.

1. Not copying the formula $\sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2}$ correctly
2. Using incorrect formulas $\sqrt{\frac{\sum f \sum fx^2}{\sum f} - \bar{x}^2}$, $\frac{\sum f(x-\bar{x})^2}{\sum f} - x^2$ as some candidates did.
3. Some candidates were calculated $\sum f \sum x^2, [\sum fx]^2, \sum f^2 x^2$ instead $\sum fx^2$.

Section C

Question No. 06

This section consists of four parts (A), (B), (C), and (D), with a total allocation of 20 marks.

(A)

- (a) It was expected to calculate the annual installment of the loan obtained by Zoysa, amounting to Rs.300,000/- at an interest rate of 20% per annum, to be settled in equal annual installments over 3 years using the formula $A = \frac{SR^n(R-1)}{R^n-1}$. An average number of candidates were unable to obtain the total score due to not choosing the correct formula, not substituting values correctly, and not simplifying accurately to the end.

- (b) This section was expected to prepare an amortization schedule to illustrate the repayment of the debt. It was observed that the majority of candidates had no knowledge of this.

(B)

- (a) In this section, candidates were expected to calculate the net present value (NPV) of each project in order to select the best investment project from the two alternatives, namely Project X and Project Y, for the entity.
- (b) This section is expected to compare the Net Present Value (NPV) and select the project with the highest net present value as the best investment project. It was observed that some candidates had no knowledge about it. Candidates have not identified that the NPV is taken from deducting the initial investment of Rs. 100,000 from the total of present values of each project. Candidates should identify that the best project should be a project with positive NPV and at the time of comparison it should be the project with highest positive NPV. A considerable number of candidates have provided the correct answer.

(c)

- (a) This section was intended to test candidates' knowledge of probability. Nimal, who travels to work by two buses, was provided with the probabilities of the first and second buses being late. The given data was expected to be represented in a tree diagram in part (a). However, many candidates did not correctly show the probabilities on the branches of the tree diagram. Some candidates were identified where the sum of the probabilities of each branch corresponding to two cases should be 1.
- (b) This section asked to calculate the probability of at least one bus being late. Only a minority of candidates answered this section correctly. Candidates should be more interested in solving probability-related problems and using tree diagrams.

- (D)** This question tested the knowledge related to normal distribution. It was asked to calculate the probability that the daily income of a sole trader, in a normal distribution with a mean of Rs. 50,000 and a standard deviation of Rs. 5,000, would be less than Rs. 55,000.

A large number of candidates did not correctly use $Z = \frac{x - \mu}{\sigma}$ to convert the given x values to the standard normal distribution values. Candidates should also be more interested in finding correct probability values using the table of a standard normal distribution.

General matters for attention to improve performance level of candidates:

- (1) Study the full contents of the syllabus completely paying more attention to any newly introduced subject matter.
- (2) Workings should be clearly shown along with answers where applicable.
- (3) It is required to correctly apply the basic mathematical rules and simplifications in copying formulae and in substitutions. Use the most convenient formula when several formulae could be applied to answer certain questions. Further, when formulae are copied, it should be done without changing “+” and “-” signs.
- (4) Some candidates may obtain final answer using calculators. However, it is appropriate to present the final answer showing the steps correctly, writing the formula and substituting the values in it. In doing so, there is a possibility of scoring the marks for steps even when the final answer may not be correct.
- (5) It should be noted to correctly apply the mathematical principles in solving equations and calculus of functions.
- (6) Handwriting should be legible and the numbers of questions should be correctly and clearly written.
- (7) Follow the instructions given in the question paper'
- (8) Perusal of past question papers and suggested answers would help sharpening knowledge and experience.
- (9) Proper management of time is important.
- (10) Re-check the question numbers before handing over the answer scripts.
- (11) There were instances when answers to new questions had been started in a small space at the end of the previous answer without starting the next answer on a new page. Each answer should be started on a new page at all times for easy reference'
- (12) Appear for the examination with a firm determination of passing the examination with due preparation.