EXAMINER'S REPORT

LEVEL I EXAMINATION - JULY 2023

(102) BUSINESS MATHEMATICS & STATISTICS

SECTION A

Question No. 01

This section has 10 multiple choice questions with question numbers **1.1** to **1.10**. It is expected to write the number of the most correct answer from the given 4 options. Majority of the candidates had written answers to these questions.

Some applicants mentioned the answer instead of writing the number of the correct answer to the question. It was seen that some candidates wrote answers for some specific questions and wrote the question number for other questions.

1.1 This is a problem relating to solving a quite simple equation. The reason why a large number of students get these answers wrong is the lack of understanding of errors of Simplification and equation solving techniques.

$$4 + 4x = x + 16$$

Here, some candidates have not understood about switching the sign of the terms while bringing from one side to another. It was common to see that the correct answer was given (x= 4) instead of that number.

1.2 This is a simple interest problem that comes under the Financial Mathematics section. Here the total interest for end of three years is expected. Here you can use the formula $I = \frac{ptr}{100}$ to get the correct answer. But some applicants did not do the correct calculation.

1.3 This is a compound interest problem that comes under the Financial Mathematics section. Here the annual interest rate is given, and the interest is calculated quarterly.

For that, the following formula should be used but it was not used correctly.

$$A = P\left(1 + \frac{r}{f}\right)^{nf}$$

In this problem the maturity value was given, and the formula was used to calculate the initial investment.

1.4 A problem associated with probability. Here it was required to find "If a student is selected at random in the class, the probability that the student chosen is a girl given that she is a member of athletic team of the class. Majority of students did not give the correct answer.

1.5 Here it was expected the approximate value for the mode of a grouped frequency distribution.

$$M_o = L + \frac{\Delta_1}{\Delta_1 + \Delta_2} \times c \qquad \Delta 1 = f1 - f \qquad \Delta 1 = f2 - f$$

The formula should be used correctly.

A considerable number of students have derived the class boundaries of the class intervals of the frequency distribution because class intervals are not continuous.

Accordingly, taking the class interval containing the model class 29.5-39.5 as the boundary, and using L =29.5, the correct answer has been obtained.

1.6 Here we want to calculate the correlation coefficient for two variables x and y with respect to five observations.

The following formula is used for this:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)\ (n\sum y^2 - (\sum y)^2)}}$$

Students had made many mistakes in substituting values for this formula. There are such mistakes in every exam Students are able to avoid such mistakes if they have observed the past papers carefully.

1.7 This is a question relating to price indices. Here we want to calculate the price relative for the year 2022 of brand C fertilizer, considering 2021 as the base year.

Although the formula $\frac{P1}{P2} \times 100$ should be used correctly, a considerable number of students have not used it correctly.

1.8 This is a problem of the intersection of two independent events. Here, the product law for the intersection of two independent events is used.

If **A** and **B** are two independent events, then P(A∩B) = P(A) X P(B).

A significant number of students gave incorrect answers without understanding the concept of probability.

1.9 This is a problem that comes under time series. Here it is expected to predict sales using seasonal index. Given trend values for the month of August 2023, expect to forecast sales values for that month. Here we use the multiplicative model. The weakness shown by the students in solving time series problems for several years has also been shown this time.

1.10 This is a compound interest problem that comes under the Financial Mathematics section. It was required to find the maturity value at the end of three years after investing Rs.500,000/- at an annual rate of interest.

The following formula is used for that,

$$A = P(1 + r)^n$$

It was expected to obtain **"A"** using the above formula. Although the use of calculators is allowed, it is unfortunate to fail to get the correct answer in a problem like this.

1.11 Among the four terms given here and the explanations given in front of them, it is expected to choose the explanation that matches each term and put the correct number in front of the corresponding English letter.

The notable points here are that the two terms related to time series that were given in **A** and **B** were exchanged by a large number of students and gave the wrong answer.

1.12 It is expected to understand the pie chart related to the data representation, get which half of 360 it is and multiply it by the total number of 240. Some applicants did not read the question carefully and indicated the number of students who are studying computer.

1.13 It is expected here to find the sum of 12 terms of an arithmetic series.

$S_n = \frac{n}{2}\{2a + (n-1)d\}$ is expected to be used correctly here.

Here, some applicants used the formula Tn = a + (n-1)d to find the 12th term instead of sum of the terms and took 59 as the answer.

Some candidates had taken $l = 59$ and used the formula $S_n = \frac{n}{2}\{a+l\}$ to get $S_{12} = 312$ as a correct answer.

In this case, the weakness of the students in substituting the formula and simplifying the formula was noticeable.

The nth term and the sum of the n terms should be mastered correctly by separating the arithmetic and geometric series.

1.14 It was required to mention the given statement is true or false. The statement is related to independent variable. However, students were unable to identify the correct status of it.

1.15 This statement was related to "an annuity". However, candidates were unable to mention whether it is true and false.

Section - B

Question No. 02

(a) Solving a pair of simultaneous equations is expected here.

One equation is X + Y = 40 and the other equation is 50,000 X + 12,500Y = 385,000.

It was quite difficult for the students to construct those two equations correctly. It was also noted that even if the equations were constructed in this way, they showed weaknesses in solving those.

(b) This was related to fractions. Some students did not understand that in practice, the number of buses should be taken as a whole number, although the number of employees should be obtained using fractions and the number of buses should be calculated based on that.

(c) A profit related problem. Some of the students did not use the number of zeros correctly in finding the 4% from the given figure.

When there is a requirement to calculate the decrease in profit, candidates can solve it by finding 96% of the given profit or deduct 4% of the profit from the given profit.

Question No. 03

(a) Some students did not understand that when the total cost and the demand function are given, the demand function must be multiplied by the quantity to find the total revenue function (TR).

$$TR = p \times q$$

The brackets of TR= (30+2q) q, did not used correctly by a large number of students.

TR=30+2q², was wrongly stated.

(b) Some students did not understand that TC = TR is the requirement for Break-Even Quantity. Some students did not get the correct answer for q by solving the equation.

(c) It should be understood that the marginal cost function is obtained by differentiating the total cost function($\frac{d(TC)}{dx}$). A large number of applicants did not have a correct understanding on differentiation.

Candidates should practice applying power rule of differentiation ($\frac{d(TC)}{dx} = nx^{n-1}$) correctly.

Question No. 04

It is expected to use the least square method to get the equation of the regression line and find y when x=72 using its equation.

$$b = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2} \qquad a = \overline{Y} - b \times \overline{X}$$

Eventhough the equations are given, some students had substituted to wrong formulas.

Also, it was very clear that 'n' value was not taken correctly and formula of 'b', was not simplified correctly. Some candidates had not understood the problem and had drawn an x and y graph and drawn a line on it.

Question No. 05

It was expected to obtain the Median and the mean of the given grouped frequency distribution.

A large number of students had not taken Li = 49.5 correctly to obtain the median considering the class boundary of the median class.

$$Md = L1 + \frac{(\frac{n}{2} + Fc)}{fm} \times c$$

In obtaining Median using the above formula, candidates should obtain the F_c from the cumulative frequency column and the class width "c" correctly.

Candidates should practice more to facilitate the calculation using code methods while taking the median.

Applicants should practice correct substitution to the formula of Coefficient of skewness (SK).

Here the applicants had tried to find the standard deviation instead of using the value given for the standard deviation.

Section - C

Question No. 06

(A) It was expected to calculate the Annual Installment using the given data:

$$A = \frac{S\ R^n(R-1)}{(R^n - 1)}$$

It was expected to use the above formula. However, candidates were unable to make the correct substitutions and errors of simplification were also observed.

(B) Considering the annual net cash flows of the two projects, it was expected to accurately calculate the two net present values (NPV) and thereby select the project with the higher NPV value as the most appropriate project.

Some candidates have used their own discounting factors to calculate the NPV, eventhough the question provided a discounting factor.

(C) A problem that comes under the probability and knowledge about conditional probability is expected here.

The performance of the students was average.

(D) This question related to normal distribution and it was requiered to be solved using the standard normal distribution.

Some students had failed to get the Z value ($z = \frac{x-\mu}{\sigma}$) correctly. Candidates should also practice reading the given normal distribution table and getting the correct probability value.

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.

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