EXAMINER'S REPORT

LEVEL I EXAMINATION - JANUARY 2022

(102) BUSINESS MATHEMATICS & STATISTICS

This Question paper consists of **3 Sections A, B** and **C**.

A total of 40 marks is allocated to **Section A** comprising, 15 compulsory Objective Test Questions (O.T.Qs.), with 10 multiple choice questions numbers **1.1** to **1.10** for 30 marks at 3 marks per question, question number **1.11** for 4 marks, 2 short questions number **1.12** to **1.13** for 4 marks at 2 marks per question and 2 short questions number **1.14** to **1.15** for 2 marks at 1 mark per question.

A few shortcomings generally observed in the answers provided by candidates to part of **question 01** are set out below:

SECTION A

Question No. 01

The weakenssess generally observed in the answers provided and observations thereon are shown below:

1.1 Solving a simple equation was required. Majority had provided the correct answers. A few candidates had however not been successful due to lack of knowledge in solving equations and errors of simplifications.

1.2 This is a problem associated with simple interest. Calculations of total interest using the formula,

$$I = \frac{Ptr}{100}$$

was expected. Majority of the candidates had provided satisfactory answers.

1.3 A simple problem associated with probability. Although it would have been possible to easily obtain the relevant probability using a Venn diagram or the basic rules relating to classes, a considerable number of candidates had been unsussessful due to not being able to clearly understand the basic theory.

1.4 It was expected to arrive at the Mode, a measurenment of central tendancy in Statistics. Although the formula,

$$M_0 = L_1 + \frac{\Delta_1}{\Delta_1 + \Delta_2} \text{ X } C$$

should have been used to arrive at the mode in a frequency distribution, it had not been done by candidates.

1.5 Although, the correlation coefficient between x and y should have been arrived at by simplification after substitution of values into the formula,

$$r = \frac{[n\Sigma xy - \Sigma x\ \Sigma y]}{\sqrt{\{[n\Sigma x^2 - (\Sigma x)^2] \times [n\Sigma y^2 - (\Sigma y)^2]\}}}$$

due to errors in simplifications and substitutions, candidates had made mistakes in their answers.

1.6 The quantity relative for the given 2 years could have very easily been calculated using the formula, $\frac{q_1}{q_0} \times 100$,

a large number of candidates had provided correct answers, while a few of them had not been successful because of failure to understand the problem.

1.7 It had been possible to easily calculate the expected value of the probability distribution of a descrete random variable using the formula,

$$E(x) = \sum_{z=1}^{n} xi\ P(x = x_1)$$

some candidates had been unsuccessful due to lack of practice in solving problems as well as errors in simplifications.

1.8 A problem associated with compound interest. Although, the maturity value of the fixed deposit could have easily been calculated using the formula, $S = A (1 + r)^n$. Some candidates had been unsuccessful due to errors in simplification and use of calculations correcly.

1.9 A problem associated with Time Series. Although the estimated average sales for the year 2022 had to be worked out using the given trend equation, $T = 2{,}759 - 177x$, a close scrutiny of the given data would revealed that the lowest sales value of 1,520 in 2022 would have been selected easily as the answer.

1.10 A problem associated with sales price and cost. This would easily be solved using the knowledge on proportion. That is,

Cost	Sales Price
100	115
?	3,680

$$\text{Cost} = \frac{3{,}680 \times 100}{115} = \textbf{Rs.3,200/-}$$

1.11 to **1.15** require short answers.

1.11 Terms such as Net Present Value (NPV), Residual Value, Trend and Regression Analysis that we come across in the fields of Time Series, regression analysis and Financial Mathematics are tested in this question. It was expected to show correctly the number relevant to the explanation of the term and it was observed that a considerable number of candidates had not understood the question correctly. The question was set clearly based on basic theory.

1.12 Only a few number of candidates had attempted this question, and this happened to be the question to which no marks had been scored. This indicates lack of attention of candidates towards basic theory.

1.13 In this question, finding the sum of the first 20 terms of an arithmetic progression was required. The numbers to this question should be obtained using the formula.

$$S = \frac{n}{2}\{2a+(n-1)d\}$$

However, a considerabe number of candidates found it difficult to arrive at the answer, even after using calculators. Some candidates had been unsuccessful as a result of incorrect sequence in simplification, i.e. +, - rule of simplification.

1.14 Candidates who had a clear understanding regarding the arithmetic progression had easily identified the statement to be false.

1.15 It had been possible for candidates to easily identify that arithemetic mean is used to measure centered tendancy. Accordingly, majority of the candidates had stated the statement to be true.

SECTION B

Question No. 02

(a) Solving a simultaneous equation was expected by this section. Some candidates lacked knowledge in solving such simple problems and also had made mistakes in simplifications.

(b) Since the salary increased by 5% every year, the salary at the end of the starting year should be recognized as Rs.75,000/-.

However, direrent incorrect answers had been provided by candidates without correctly understanding that facts.

(c) This part is a problem relating to indices. Although the Laspeyre's Price Index,

$$\frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

had been given in the formula sheet of the question paper, majority of the candidates had applied the '∑' sign incorrectly as,

$$\frac{\sum q_1 p_0}{\sum q_0 p_0} \times 100$$

Candidates should be more careful in dealing with calcualtions involving the '∑' sign.

Question No. 03

(a) Identification of Total Cost (TC) and Total Revenue (TR) was required by this part.

Candidates had been unsuccessful in not realizing the fact that the,

Total Cost Function = Variable Cost + Fixed Cost.

(b) In order to arrive at marginal cost, the differentiation method should have been applied for the tested cost function. In order to arrive at the total revenue function, the demand function has to be multiplied by the number of units of goods and for marginal revenue the diferentiation method should have been applied for the revenue Function. Here, candidates had been unsuccessful being unable to correctly apply the power rule applicable in diferentiation.

(c) Although the number of units at which the total cost function equals the total revenue function should be ascertained to arrive at the breakeven quantity, a large number of candidates had not succesfuly used that equation to arrive at the answer. Majority of the candidates had erroneously taken MC = MR instead of TC = TR.

Question No. 04

(a) A problem associated with the correlation between 2 variables in a regression analysis. It was required to identify the linear relationship, $y = a + bx$ between the advertising cost and sales quantity in the given table.

The value of 'a' and 'b' of the equation $y = a + bx$ should be ascertained from the formula,

$$b = \frac{[n\Sigma xy - \Sigma x\ \Sigma y]}{[n\ \Sigma x^2 - (\Sigma x)^2]} \quad \text{and} \quad \bar{y} = a + b\bar{x}$$

Instead, some candidates had drawn a dotted line between x and y and attempted to show a relationship using a scatter diagram.

(b) Candidates had made mistakes in calculating the expected sales due to not correctly interpreting the value of x given in the table in Rs.'000 s (thousands).

Question No. 05

Calculating the measurements of central tendancies dealt with in Statistics from the given frequency distribution was expected. Thereafter, co-efficient of variation had to be calculated.

(a) Considerable number of candidates were failed to obtain mid value of class intervals correctly and hence could not obtain the mean correctly.

(b) In arriving at the variations, majority of the candidates had failed to correctly identify the formula,

$$S^2 = \frac{\sum_{i=1}^{n} fi\, xi^2}{\sum f} - \bar{x}^2$$

Some candidates had calculated as $\sum_{i=1}^{n} fi\, xi^2$ instead of $\sum_{i=1}^{n} (f_i x_i)^2$.

Calculation of standard diviation had also gone wrong as a result of the above error.

(c) It was required to use the formula, $\frac{Standard\ deviation}{Mean} = \frac{\sigma}{x}$ X 100

to arrive at co-efficient of variation.

Hence, some candidates had not done 100% multiplication while some others had used variation instead of standard deviation.

SECTION C

Question No. 06

This question carrying a total of 20 marks consisted of 4 points.

(A) **(a)** Calculation of annual loan installment coming under Financial Mathematics was expected. Using either the formula ,

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

or 2.577, the 8% Cumulative Discounting Factor it would have been possible to easiy obtain the answer. Although, a considerable number of candidates had correctly substituted into the formula, they had failed to correctly simplify and arrive at the answer for A.

(b) Majority of the candidates had no idea about the amortization table in order to indicate the loan repayment.

(B) The ability of candidates to calculate the Net Present Value of the 2 given options and their knowledge and ability to select the most profitable one was tested by this question. A considerable number of candidates had not been able to obtain correctly the Net Present Values while some of them had failed to deduct the initial value from the total of present values.

Some other candidates, although, they obtained the 2 Net Present Values, had not been able to select the suitable option out of the values they computed.

(C) This is a problem associated with probability. Interpreting the formula,

$$P\,(B/A) = \frac{P(A \cap B)}{P(B)}$$

it could have easily been solved. Instead of such interpretation, some candidates had marked probability in a Venn diagram and attempted to arrive at the answer. Some candidates created confusion in writing the answer without any working.

(D) It was expected to obtain the relevant profitability from the normal distribution. Because,

$X \sim N(\mu = 2.5, \sigma = 0.45)$ in finding $P(X \times 3)$

$$Z = \frac{3 - 2.5}{0.45} = 1.11$$

Hence, some candidates had erroneously calculated by substituting,

$$Z = \frac{\mu - X}{\sigma} \quad \text{instead of} \quad Z = \frac{X - \mu}{\sigma} \ .$$

The knowledge of candidates to obtain the necessary probability correctly after reading the standard distribution tables was at a very low level.

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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