ASSOCIATION OF ACCOUNTING TECHNICIANS OF SRI LANKA

LEVEL I EXAMINATION - JULY 2025

(102) BUSINESS MATHEMATICS AND STATISTICS

03-08-2025
Morning
[09.00 – 12.00]

No. of Pages : 09
No. of Questions : 06

- **Instructions to candidates** (Please Read Carefully)**:**
  - (1) ***Time:*** *03 hours.*
  - (2) ***All questions should be answered.***
  - (3) ***Answers*** *should be in* ***one language****, in the* ***medium*** *applied for, in the* ***booklets*** *provided.*
  - (4) *Submit all workings and calculations. State clearly assumptions made by you, if any.*
  - (5) *Use of Non-programmable calculators is* ***only*** *permitted.*
  - (6) ***Mathematical Tables*** *will be provided.*
  - (7) ***Action Verb Check List*** *with definitions is attached. Each question will begin with an* ***action verb*** *excluding OTQ's. Candidates should answer the questions based on the* ***definition*** *of the verb given in the Action Verb Check List.*
  - (8) ***Formulae Sheets*** *are attached.*
  - (9) *100 Marks.*

SECTION A

Objective Test Questions (OTQs)

(Total 40 marks)

Question 01

Select the most correct answer for question No. ***1.1*** *to* ***1.10****. Write the number of the selected answer in your answer booklet with the number assigned to the question.*

1.1 Factors of , $16 - y^2$ are:

(1) $(4 - y)(4 - y)$ (2) $(4 + y)(4 + y)$

(3) $(4 - y)(4 + y)$ (4) $(4y - y)(4y + y)$ (03 marks)

1.2 **Nimal** invested Rs.50,000/- in a bank at the simple interest rate of 12% per annum. The total interest on the investment at the end of 4^{th} year would be:

(1) Rs.6,000/- (2) Rs.24,000/- (3) Rs.28,676/- (4) Rs.12,720/-

(03 marks)

1.3 The following summary statistics are provided in relation to variables ***x*** and ***y***:

$$\sum x = 24\,,\ \ \sum y = 179\,,\ \sum x^2 = 138\,,\ \sum y^2 = 6499\,,\ \ \sum xy = 904\,,\ \ \ n = 5$$

Based on the above data, the correlation coefficient between ***x*** and ***y*** would be:

(1) 0.9132 (2) 0.0251 (3) 0.9321 (4) 0.9846

(03 marks)

1.4 The prices of three brands of imported vehicles by a company in 2020 and 2024 are tabulated below:

Brand	Price in Rs. million (2020)	Price in Rs. million (2024)
A	1.5	4.3
B	3.0	7.2
C	2.5	6.8

The price relative of brand **C** vehicle, considering the year 2020 as the base year is:

(1) 2.72% (2) 272% (3) 36.76% (4) 240%

(03 marks)

1.5 **Nihal** invested Rs.25,000/- in a fixed deposit at the interest rate of 5% per annum compounded semi-annually. The maturity value of the fixed deposit after 4 years would be *(to the nearest integer)*:

(1) Rs.30,100/- (2) Rs.31,500/- (3) Rs.30,460/- (4) Rs.30,090/-

(03 marks)

1.6 You are given the following information on two independent events **A** and **B**:

$P(A) = \frac{3}{4}$ and $P(B) = \frac{3}{5}$,

Based on the above information, $P(\text{A} \cap \text{B})$ is:

(1) $\frac{9}{20}$ (2) $\frac{3}{20}$ (3) $\frac{3}{10}$ (4) $\frac{1}{20}$

(03 marks)

1.7 The following table shows the probability distribution of the number of cakes sold by **Mallika Cake Shop** during a specified 30 minutes time interval:

Number of Cakes Sold (X)	0	1	2	3	4
Probability P(*x*)	0.15	0.30	0.20	0.10	0.25

Based on the above data, the expected value of cakes sold by **Mallika Cake Shop** would be:

(1) 3 (2) 1 (3) 5 (4) 2

(03 marks)

1.8 The following table shows age distribution of pensioners in a specific region:

Age (in years)	50-59	60-69	70-79	80-89	90-99
No. of Pensioners (*f*)	20	30	40	10	4

The median age of the pensioners in this region is (approximately):

(1) 75 (2) 70 (3) 68 (4) 77

(03 marks)

1.9 **Achintha** obtained a loan of Rs.80,000/- from a bank at an interest rate of 4% per annum compounded annually. The loan is to be repaid in full after 3 years. The total interest to be paid by **Achintha** at the end of 3rd year would be *(to the nearest integer)*:

(1) Rs.3,200/- (2) Rs.6,528/- (3) Rs.9,989/- (4) Rs.10,093/-

(03 marks)

1.10 Quarterly sales figures of a restaurant chain from years 2018 to 2024 were used to determine the following seasonal indices:

	1st quarter	**2nd quarter**	**3rd quarter**	**4th quarter**
Seasonal index	1.48	1.14	0.57	0.81

If the estimated trend value for the 4th quarter of 2024 was 8,560, the forecasted sales value for the 4th quarter is *(to the nearest integer)*:

(1) 12,669 (2) 4,880 (3) 6,800 (4) 6,934

(03 marks)

*Write the answers for question No. **1.11** to **1.13** in your answer booklet with the number assigned to the question.*

1.11 Relate the terms given on the left hand side of the following table with the number of the appropriate explanation given on the right hand side:

Term	**Explanation**
(A) Compound interest	**(1)** The total sum of values in a sample of data divided by the number of values in the sample.
(B) Variance	**(2)** Interest accumulated from a principal sum and previously accumulated interest.
(C) Mean	**(3)** The measure of dispersion of a set of data points around their mean value.

(01 mark each, 03 marks)

1.12 A shopkeeper buys a TV remote for Rs.1,000/- from a supplier. He wants to sell it at a profit margin of 15% on the cost.

Calculate the selling price of a TV Remote. (02 marks)

1.13 The following table shows the prices and quantities of three products for the years 2023 and 2024:

Products	Quantity (in units)		Price (Rs.)	
	2023 (q_0)	**2024 (q_1)**	**2023 (p_0)**	**2024 (p_1)**
A	540	600	15	12
B	200	250	4	5
C	450	350	5	7

Consider 2023 as the base year.

Based on the above information,

Calculate the Paasche's Price Index (Current Weighted Aggregative Price Index) for the year 2024. (03 marks)

*State whether each of the following statements (**1.14** and **1.15**) is **True** or **False**. Write the answer (True/False) in your answer booklet with the number assigned to the question:*

1.14 Seasonal variation is a repetitive periodic fluctuations. (01 mark)

1.15 The trend equation of a company's quarterly profits is given as, $T = 2000 + 250t$ 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. (01 mark)

(Total 40 marks)

End of Section A

SECTION B

(Total 40 marks)

Question 02

(a) An amount of Rs.500,000/- was divided among **Amal, Bimal** and **Chamal.** The amount received by **Amal** and **Bimal** were in the ratio of 3:2 respectively and **Bimal** and **Chamal** in the ratio of 3:5 respectively.

You are required to:

Calculate the amount of money that **Amal** has received. (03 marks)

(b) A sum of Rs.4,000/- was distributed among the students of a class. Each boy received Rs.80/- and each girl received Rs.40/-. The total number of students in the class was 60.

You are required to:

Calculate the number of girls and the number of boys in the class. (04 marks)

(c) **Nethmi** decided to save money every week to buy a new bicycle. In the first week, she saved Rs.500/-, and she increased the amount by Rs.150/- each week.

You are required to:

Calculate the amount that she will save in the 10th week. (03 marks)

(Total 10 marks)

Question 03

A manufacturing company produces product "**X**" and Total Cost (TC) function per month is $1,800 - 6q + 24q^2$ and the demand function per month is given by $P = 24q - 3$.

(Where "q" is the number of units produced during the month.)

You are required to:

(a) **Identify** the Total Revenue (TR) function and Marginal Cost (MC) function of the firm. (03 marks)

(b) **Calculate** the Break-Even Quantity. (04 marks)

(c) **Calculate** the selling price per unit at the Break-Even Quantity. (03 marks)

(Total 10 marks)

Question 04

The following table shows the age of a company's motor vehicles and the corresponding maintenance expenses for the last 7 years:

Age (x) (in years)	10	8	7	6	4	5	2
Maintenance Expenses (y)(Rs.'000)	70	72	73	80	83	85	90

Using the above data,

You are required to:

(a) **Identify** the least squares regression line given by $y = a + bx$ to represent the relationship between age of vehicle and maintenance expenses. (08 marks)

(b) **Calculate** the annual expected maintenance expense of the company, if the age of motor vehicle is 12 years. (02 marks)

(Total 10 marks)

Question 05

The school teachers have been instructed to record weekly study hours of A/L students. The collected data from a school has been grouped and summarized in the table below:

Weekly Study Hours	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 – 59
No. of Students (f)	5	8	12	20	9	4

Using the above data,

You are required to:

Calculate the following:

(a) Mode. (03 marks)

(b) Mean. (03 marks)

(c) Standard Deviation. (04 marks)

(Total 10 marks)

End of Section B

SECTION C

(Total 20 marks)

Question 06

(A) **Zoysa** obtained a loan of Rs.300,000/- from a bank at an interest rate of 20% per annum and it is to be settled in equal annual installments of 3 years.

You are required to:

(a) **Calculate** the annual installment of the loan. (03 marks)

(b) **Prepare** the amortization schedule to illustrate the repayment of the debt. (03 marks)

(B) **ABC PLC** is planning to select the best project from two (2) investment projects **(Project X** and **Project Y)**. Initial investment cost is Rs.100,000/- for each project and net cash inflows for next 4 years of both projects are as follows:

Year / Option	1 (Rs.)	2 (Rs.)	3 (Rs.)	4 (Rs.)
X	50,000	40,000	30,000	10,000
Y	10,000	30,000	40,000	50,750

The discounting factor (Cost of Capital) of the company is 10% per annum.

You are required to:

(a) **Calculate** the Net Present Value (NPV) of each project. (04 marks)

(b) **Identify** the best investment project with reasons based on the NPV. (02 marks)

(C) **Nimal** has to catch 2 buses to reach his work place. The probability that the first bus will get late is 0.10 and the probability that the second bus will get late is 0.30.

You are required to:

(a) **Draw** a tree diagram to show the above data. (02 marks)

(b) **Calculate** the probability that at least one bus will get late. (02 marks)

(D) The daily income of a sole trader is normally distributed with a mean of Rs.50,000/- and a standard deviation of Rs.5,000/-.

You are required to:

Calculate the probability that the sole trader's daily income will be less than Rs.55,000/-. (04 marks)

(Total 20 marks)

End of Section C

ACTION VERBS CHECK LIST

Level of Competency	Description	Action Verbs	Verb Definitions
Knowledge (1)	Recall Facts and Basic Concepts.	**Draw**	Produce a picture or diagram.
		Relate	Establish logical or causal connections.
		State	Express details definitely or clearly.
		Identify	Recognize, establish or select after consideration.
		List	Write the connected items.

Level of Competency	Description	Action Verbs	Verb Definitions
Comprehension (2)	Explain & Elucidates Ideas and Information.	**Recognize**	Show validity or otherwise, using knowledge or contextual experience.
		Interpret	Translate into understandable or familiar terms.
		Describe	Write and communicate the key features.
		Explain	Make a clear description in detail using relevant facts.
		Define	Give the exact nature, scope or meaning.

Level of Competency	Description	Action Verbs	Verb Definitions
Application (3)	Use and Adapt Knowledge in New Situations.	**Reconcile**	Make consistent / compatible with another.
		Graph	Represent by graphs.
		Assess	Determine the value, nature, ability or quality.
		Solve	Find solutions through calculations and/or explanation.
		Prepare	Make or get ready for a particular purpose.
		Demonstrate	Prove or exhibit with examples.
		Calculate	Ascertain or reckon with mathematical computation.
		Apply	Put to practical use.

Level of Competency	Description	Action Verbs	Verb Definitions
Analysis (4)	Draw Connections Among Ideas and Solve Problems.	**Communicate**	Share or exchange information.
		Outline	Make a summary of significant features.
		Contrast	Examine to show differences.
		Compare	Examine to discover similarities.
		Discuss	Examine in detail by arguments.
		Differentiate	Constitute a difference that distinguishes something.
		Analyze	Examine in details to find the solution or outcome.

FORMULAE SHEETS

Mathematical Fundamentals:

Quadratic equation:

The solutions of a quadratic equation, $ax^2 + bx + c = 0$ is given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Arithmetic sequence:

Term of an arithmetic sequence:

$T_n = a + (n - 1)\, d$

The sum of first n terms of an AP:

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

Geometric sequence:

The term of a geometric sequence,

$T_n = ar^{n-1}$

The sum of first n terms of a GP:

$$S = a\,\frac{\{r^n - 1\}}{\{r-1\}} \quad \text{if} \quad r > 1$$

$$S = a\,\frac{\{1-r^n\}}{\{1-r\}} \quad \text{if} \quad r < 1$$

$$S = na \quad \text{Otherwise} \quad r = 1$$

Quantitative Finance:

Simple interest:

$S = X\,(1 + nr)$

Compound Interest:

$S = X\,\{1 + r\}^n$

Discounting:

$$\text{Present Value} = \text{Future Value} \times \frac{1}{(1+r)^n}$$

Repayment of mortgage / Loan:

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

Effective Interest Rate:

$EIR = \{(1 + r)^n - 1\}\,100\%$

Numerical Descriptive Measures:

Mean $\bar{x}$:

For ungrouped data: $\frac{\sum x}{n}$

For grouped data: $\frac{\sum fx}{\sum f}$

Median:

For Ungrouped data $M_d = \frac{(n+1)^{th}}{2}$ term

For Grouped data $M_d = L_1 + \left(\frac{\frac{n}{2} - F_c}{f_m}\right) \times C$

Mode:

Grouped data $M_0 = L_1 + \frac{\Delta_1}{\Delta_1 + \Delta_2} \times C$

Standard deviation σ:

For ungrouped data:

$$\sqrt{\frac{\sum(x - \bar{x})^2}{n}} \quad \text{or} \quad \sqrt{\frac{\sum x^2}{n} - \bar{x}^2}$$

For grouped data:

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

Coefficient of variation (CV):

$$\frac{Standard\ deviation}{Mean} = \frac{\sigma}{\bar{x}} \times 100$$

$$\text{Coefficient of skewness} = \frac{3(\text{Mean} - \text{Median})}{\text{Standard Deviation}}$$

Comparing Two Quantitative Variables:

Correlation coefficient (r):

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

Regression line under least square method (a and b):

$$b = \frac{[n\sum xy - \sum x \sum y]}{[n\sum x^2 - (\sum x)^2]}$$

$a = \bar{y} - b\bar{x}$

Comparison over time with Economic variables

Index Numbers:

Price Relative $= \frac{p_1}{p_0} \times 100$

Quantity Relative $= \frac{q_1}{q_0} \times 100$

Value Relative $V_{1/0} = \frac{p_1 q_1}{p_0 q_0} \times 100$

Simple aggregate price index $= \frac{\sum p_1}{\sum p_0} \times 100$

Simple aggregate quantity index $= \frac{\sum q_1}{\sum q_0} \times 100$

Average price relative $= \frac{1}{n} \sum \frac{p_1}{p_0} \times 100$

Average quantity relative $= \frac{1}{n} \sum \frac{q_1}{q_0} \times 100$

Weighted aggregate indices

1) Base-weighted / Laspeyre's:

   Price index $= \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$

   Quantity index $= \frac{\sum q_1 p_0}{\sum q_0 p_0} \times 100$

2) Current-weighted / Paasche's:

   Price index $= \frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$

   Quantity index $= \frac{\sum q_1 p_1}{\sum q_0 p_1} \times 100$

3) Using standard weights

   Price index $= \frac{\sum p_1 w}{\sum p_0 w} \times 100$

   Quantity index $= \frac{\sum q_1 w}{\sum q_0 w} \times 100$

Weighted average of relatives

Price index $= \frac{\sum [w \times I_p]}{\sum w} \times 100$

Quantity index $= \frac{\sum [w \times I_q]}{\sum w} \times 100$

Time Series:

Multiplicative Model

$Y = T \times S \times C \times R$

Sets and Probability

$\cup$ - Union; A∪B defines all elements in A plus all elements in B, no element being counted twice.

$\cap$ - Intersection; A∩B defines all elements included in both A and B.

P (A) – Probability of event A
P (A/B) – Probability of event A, given B

General rules:

P (A∪B) = P (A) + P (B) – P (A∩B)

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

Expectation and Variance of a discrete random variable:

$E(X) = \sum(probability \times pay\ off) = \sum p \times x$

$VAR(X) = \sum px^2 - (\sum px)^2$

Normal Distribution:

$Z = \frac{x - \mu}{\sigma}$