

THE ASSOCIATION OF ACCOUNTING TECHNICIANS OF SRI LANKA

INTERMEDIATE EXAMINATION - JULY 2014

(51) BUSINESS MATHEMATICS AND STATISTICS

Time: 03 hours

27-07-2014
Morning
[9.00 – 12.00]

• **Instructions to candidates:**

- (1) This paper consists of three (03) Sections **A, B & C.**
- (2) **Five (05) questions should be answered as follows:**
- **Question No.01 of Section A**
 - **Both questions of Section B**
 - **Any two (02) questions from Section C**
- (3) Submit all **workings** and **calculations**. State clearly **assumptions** made by you, if any.
- (4) Use of calculators is permitted.
- (5) **Answers** should be in **one language**, in the **medium** applied for, in the **booklets** provided.
- (6) Graph papers will be provided.
- (7) 100 Marks.

No. of Pages : 08
No. of Questions : 06

SECTION - A

Multiple Choice Questions
Answer all questions of this Section.
30 marks

- 01.** Select from (1), (2), (3) and (4) the **most correct** answer to each of the following questions. Write the number of the selected answer in your answer booklet with the English letter assigned to the question.

(A)
$$\left(\frac{256a^{-2} b^2}{9a^4} \right)^{-\frac{1}{2}}$$

When the above expression is simplified, the answer is:

(1) $\frac{3a^3}{16b}$ (2) $\frac{3a^2}{16b}$ (3) $\frac{16b}{3a^3}$ (4) $\frac{16b}{3a^2}$

- (B) Factors of $7x^2 + 12x + 5$ are:

(1) $(7x + 12)(x + 5)$ (2) $(7x + 7)(x + 5)$
(3) $(x + 12)(x + 5)$ (4) $(7x + 5)(x + 1)$

- (C) A person deposits a certain amount of money at the end of each year to build a fund of Rs.100,000/- at the end of 4th year. Compounded annual interest rate is 10%. The amount that has to be deposited each year by him is:
(to the nearest integer)

(1) Rs.20,000/- (2) Rs.25,000/-
(3) Rs.21,547/- (4) Rs.22,500/-

(D) If $A = \begin{pmatrix} -2 & -2 \\ 1 & 2 \end{pmatrix}$, adjoint of the matrix A is given by:

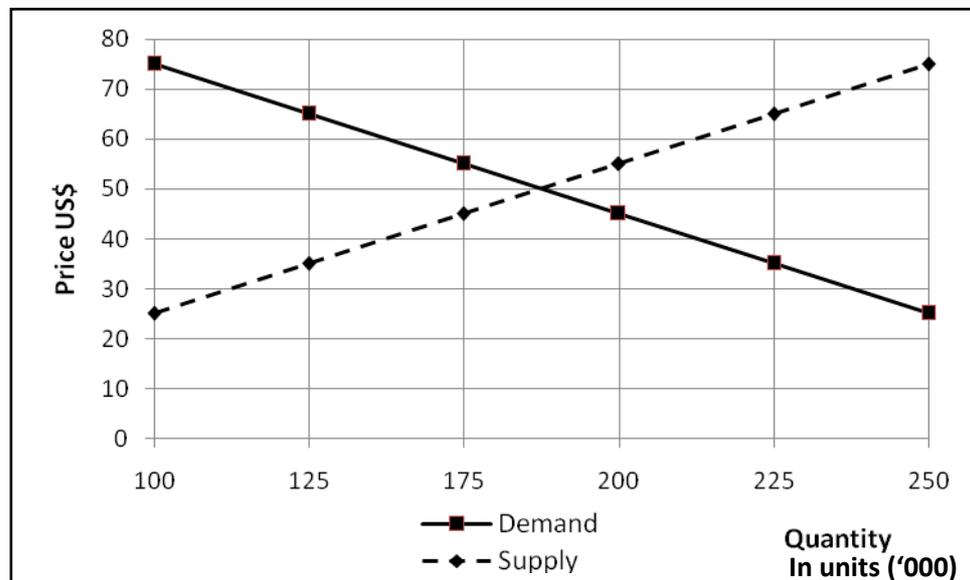
- (1) $\begin{pmatrix} 2 & 1 \\ -2 & -2 \end{pmatrix}$ (2) $\begin{pmatrix} 2 & 2 \\ -1 & -2 \end{pmatrix}$ (3) -2 (4) $\begin{pmatrix} -2 & 1 \\ -2 & 2 \end{pmatrix}$

(E) $\log_{10} 5 + \log_{10} (5x + 1) = \log_{10} (x + 5) + 1$

When the above logarithmic function is solved, value of x is:

- (1) $x = 1$ (2) $x = 3$ (3) $x = 10$ (4) $x = 5$

(F) The demand and supply curves for a new product of a mobile phone business are given below:



The equilibrium price and quantity respectively are:

- (1) US\$ 75 and 100,000 units. (2) US\$ 75 and 190,000 units.
 (3) US\$ 50 and 190,000 units. (4) US\$ 50 and 100,000 units.

(G) The Total Cost function (TC) of a vehicle manufacturer is; **TC (in Rs. million) = 10 + 10q** (where q is the quantity manufactured). The Average cost (AC) and Marginal cost (MC) for 5 vehicles respectively are:

- (1) AC = Rs.12 million, MC = Rs.10 million.
 (2) AC = Rs.10 million, MC = Rs.10 million.
 (3) AC = Rs.60 million, MC = Rs.10 million.
 (4) AC = Rs.10 million, MC = Rs.60 million.

(L) The time taken to travel for work by 20 employees can be categorized as follows:

Time taken to travel for work (in minutes)	Frequency
01 - 05	2
06 - 10	7
11 - 15	8
16 - 20	3

Based on the above data, the median time in minutes is:
(to the nearest integer)

- (1) 11 (2) 8 (3) 13 (4) 9

(M) Final results of an Engineering Certificate Course is calculated based on the results obtained for Assignments, Practical and Final Written Exam. Assignments and Practical will carry 25% and 30% weights respectively and results of three students are as follows:

Student	Assignments	Practical	written Exam
Amal	72%	75%	72%
Sunil	62%	75%	85%
Kasun	88%	75%	66%

Based on the results of the above three(03) students, the student who obtained the highest marks would be:

- (1) **Amal.** (2) **Sunil.** (3) **Kasun.** (4) All three.

(N) Which one of the following statements would best describe the two events **A** & **B** which are mutually exclusive?

- (1) **A** & **B** are dependent variables.
(2) **A** & **B** can occur at the same time.
(3) **A** & **B** cannot occur at the same time.
(4) None of the above.

(O) The rank correlation coefficient of the marks obtained for two subjects is -1. Which one of the following statements is true regarding the two subjects?

- (1) There is no relationship between the performances of the two subjects.
(2) If the marks obtained for one subject is high, the marks for the other subject is also high.
(3) If the marks obtained for one subject is high, the marks for the other subject is low.
(4) The value can't be -1, there is an error in calculating the rank correlation coefficient.

(02 marks each, Total 30 marks)

SECTION - B

Compulsory Questions

Answer both (02) questions of this Section

50 marks

02. (a) **A** invited **B** to invest in **A**'s new business and commenced the business on 01st April 2013. **A** invested Rs.20 million and **B** invested Rs.80 million. Four(04) months after commencing the operations, **B** sold half of his share to **A**. The profit for the year ended 31st March 2014 of the business was Rs.18 million. If the first year profit should be divided according to the invested amount and the duration of the investment, calculate the first year profit share of **A** and **B** separately. (06 marks)

- (b) Write the expansion of $(x-3)^5$ using binomial theorem. (05 marks)

- (c) The research team of a manufacturer manufactures a new product. The marketing manager carried out a market research and identified the following demand function and supply function for a product:

$$\text{Supply } P = 2q^2 + 20q$$

$$\text{Demand } P = 180 - 6q$$

Where, "P" is the price per unit (Rs. in thousands) and q is the quantity.

Draw the demand and supply curves on a graph paper and find the equilibrium price and quantity.

(Note: select the quantity ranging from 1 to 7 units) (06 marks)

- (d) (i) A company intends to invest in a new project with an initial capital investment of Rs.100,000/-. The forecasted net cash inflows from the investment for the next first 5 years are as follows:

Year	1	2	3	4	5
Net Cash inflow (Rs.)	60,000	60,000	40,000	30,000	20,000

The required rate of return of the company is 12% per annum.

Compute the Net Present Value (NPV) of the investment.

You may use the following discounting factors at 12%.

Year	1	2	3	4	5	6
Discounting Factor @ 12%	0.893	0.797	0.712	0.636	0.567	0.507

(05 marks)

- (ii) In order to receive Rs.50,000/- per annum in perpetuity, how much should a person invest now at the rate of 8% per annum? (03 marks)

- (e) A publisher of books uses the following equation to calculate the cost of a book that he prints.

$$C = 50 + \frac{20}{(x + 0.02y - 3)^2} + y$$

Here "C" is the cost of a copy in rupees, x is the number of copies printed in thousands. y is the number of pages in thousands.

If the cost per copy of the book is Rs.75/- which is having 600 pages, calculate the number of copies printed. (05 marks)
(Total 30 marks)

- 03.** (a) (i) Explain the difference between "Primary Data" and "Secondary Data". (02 marks)
- (ii) Calculate the geometric mean of the following data series:
50, 72, 54, 82, 93 (02 marks)

- (b) In a garment factory, sewing machine operators can manufacture 120 – 170 garments per day depending on his / her experience and skills. The number of garments manufactured by operators per day are categorized as follows:

Number of garments	Number of operators
$120 < x \leq 130$	2
$130 < x \leq 140$	n
$140 < x \leq 150$	25
$150 < x \leq 160$	10
$160 < x \leq 170$	8

If the average number (Mean) of garments produced per day by an operator is 148.4:

- (i) Calculate the value of " n ".
- (ii) Calculate variance and standard deviation of the garments manufactured per day. (08 marks)
- (c) The table below shows details of 3 items, **A**, **B** and **C** for the last 2 years:

Item	2012		2013	
	Price per unit (Rs.)	Quantity	Price per unit (Rs.)	Quantity
A	20	100	28	160
B	11	18	30	37
C	15	5	20	6

Calculate the following price indices considering 2012 as the base year:

- (i) Laspeyre's price index.
- (ii) Paasche's price index. (08 marks)
(Total 20 marks)

SECTION - C

Answer **any** two (02) questions only from this Section
20 marks

04. (a) A conference hall needs to be arranged for a business forum. According to the seating arrangement, the first row has 40 seats and each successive row has 5 more seats than the previous row.
- (i) Find the total number of seats in the first 20 rows.
- (ii) If 2,000 business leaders are expected to attend the forum, compute how many rows of seats have to be arranged. (04 marks)
- (b) A survey was conducted by a team of university researchers in order to find solutions to heavy traffic during the day-time in the Colombo district. In the survey, a random sample of 50 motorists was asked the distance they drive to work daily. The results of the survey are shown in the table below:

Distance (km)	$0 < x \leq 10$	$10 < x \leq 20$	$20 < x \leq 30$	$30 < x \leq 40$	$40 < x \leq 50$
No. of motorists	10	17	13	6	4

Using the above data:

- (i) Draw a histogram on a graph paper.
- (ii) Find the mode value of the distribution using the histogram. (06 marks)
(Total 10 marks)
05. (a) The demand function of a product is $D = 500 - 2q$ and the total cost function (C) is given by,
- $$C = 300q + 2000$$
- Where q is the number of units manufactured:
- (i) Find the total revenue function (TR) and total profit function (TP).
- (ii) In order to maximize profit, how many units have to be produced? (06 marks)
- (b) There are two production lines **A** and **B** in a factory. Both production lines produce the same item and the same number of quantities per day. The defective units coming from the production lines are categorized as machine errors, labour errors and other errors.

The following table depicts the probabilities of defect types of the two production lines:

Production Line	Machine Errors	Labour Errors	Other Errors
A	0.2	0.7	0.1
B	0.3	0.5	0.2

If a defective item is selected at random:

- (i) Find the probability that the defect is due to labour errors.
 - (ii) Find the probability that the defective item is a machine error from line **A** or a labour error from line **B**. (04 marks)
- (Total 10 marks)

- 06.** (a) Two persons invested money in a business at a ratio of 3:4. If they invest another 8 million each in the business, then the amount invested is at the ratio of 10:13. Find the original amount invested by each person in the business. (04 marks)

- (b) The International Cricket Council (ICC) ranks cricket teams based on the assessment of performance separately for Test and ODIs. (The team with the highest score ranks as 1).

The assessment scores of five teams are as follows:

Match \ Country	A	B	C	D	E
Score for test Matches (<i>x</i>)	88	65	76	47	95
Score for ODI (<i>y</i>)	97	80	69	57	85

Using the above information:

Calculate the Spearman's rank correlation coefficient and comment on the correlation between Test and ODIs. performance of the above teams.

You may use the following formula,

$$r' = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

(06 marks)
(Total 10 marks)