

THE ASSOCIATION OF ACCOUNTING TECHNICIANS OF SRI LANKA

INTERMEDIATE EXAMINATION - JANUARY 2013

(51) BUSINESS MATHEMATICS AND STATISTICS

Time: 03 hours

27-01-2013
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) Factors of $50 - 2y^2$ are:

- (1) $(25 - 2y)(25 + 2y)$ (2) $2(5 - y)(5 + y)$
(3) $2(y - 5)(y + 5)$ (4) $2(25 - y)(25 + y)$

(B) **DD PLC** commenced production of a new product recently. The number of units produced during the first week was 600. The manager expects to increase the weekly production by 20 additional units each week more than the previous week. Accordingly, the total number of units produced by **DD PLC** at the end of 15th week would be:

- (1) 11,100 units. (2) 880 units.
(3) 10,440 units. (4) 12,200 units.

(C) $\log_3 81 - \log_5 \left(\frac{1}{125} \right) - \log_4 1$:

The value of the above logarithmic expression is:

- (1) 7 (2) 0 (3) 5 (4) -1

- (H) A Plantation company has Tea, Coconut and Rubber estates. The total number of estates is 10. The number of Rubber Estates is the same as the number of Coconut Estates. The total number of Tea and Rubber estates is 7.

How many Tea estates and how many Rubber estates are owned by the company?

- | | | | |
|-----|--------------------|-----|--------------------|
| (1) | Tea estates = 6 | (2) | Tea estates = 4 |
| | Rubber estates = 4 | | Rubber estates = 3 |
| (3) | Tea estates = 3 | (4) | Tea estates = 13 |
| | Rubber estates = 4 | | Rubber estates = 3 |

- (I) The total revenue function $R(x)$, and the Total cost function $C(x)$ of a garment manufacturer are given below:

$$R(x) = 60x - 0.5x^2$$

$$C(x) = 3x + 8$$

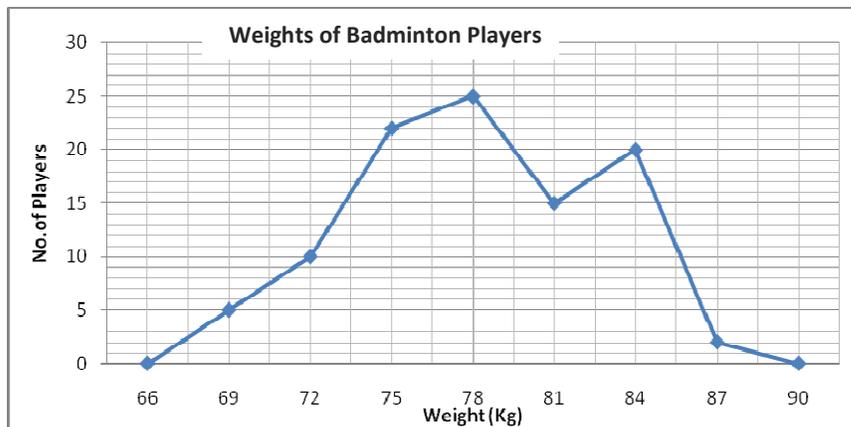
Calculate the number of garments (x), needed to be manufactured and sold to maximize profit according to the above revenue and cost functions:

- (1) 8 (2) 114 (3) 67 (4) 57

- (J) When a sample is selected from a population, if each item in the population has an equal chance of getting into the sample, it is known as:

- | | |
|---------------------------|-----------------------------|
| (1) Convenience sampling. | (2) Simple random sampling. |
| (3) Quota sampling. | (4) Stratified sampling. |

- (K) The frequency polygon below represents the Weights of Badminton Players.



What percentage of the Badminton players had a weight of less than 76.5 kilograms?

- (1) 37% (2) 63% (3) 15% (4) 88%

(L) The probability of getting Head (H) in a coin is $\frac{4}{7}$. When this coin is tossed twice, the probability of getting Tail (T) in both times is:

- (1) $\frac{16}{49}$ (2) $\frac{24}{49}$ (3) $\frac{9}{49}$ (4) $\frac{12}{49}$

(M) The price of a litre of diesel in year 2000 was Rs.32/- and it is Rs.112/- in year 2012. Find the price relative in year 2012, considering year 2000 as the base year:

- (1) 28.57% (2) 285.7% (3) 35% (4) 350%

(N) Profit After Tax (PAT) of **Amal Glass (Pvt) Ltd.** for the first 5 years of its operation are given below:

Year	PAT (Rs. Millions)
1	2.4
2	3.5
3	1.7
4	5.2
5	4.1

What is the Geometric Mean of PAT (in Millions)?

- (1) 17.44 (2) 3.14 (3) 3.38 (4) 3.50

(O) The number of units sold in a shop during six days is given below:

15, 13, 14, 16, 15, 17

The Mean Deviation of the above data is:

- (1) 15 (2) 0 (3) 1 (4) 1.2

(02 marks each, Total 30 marks)

SECTION - B

Compulsory Questions

Answer both (02) questions of this Section

50 marks

02. (a) A company is planning to construct a 3 star hotel in Galle. It will consist of 100 rooms. There will be 25 luxury rooms, 30 deluxe rooms and 45 standard rooms. The total cost of construction will be Rs.100 Million. The cost allocation ratio for total luxury, total deluxe and total standard rooms will be 5 : 3 : 2 respectively.

Calculate the construction cost allocated for a luxury room? (05 marks)

- (b) Board of directors of **Cina Labels (Pvt) Ltd.** is considering 2 investments.

Investment 1:

This requires an initial investment (initial cost) of Rs.10,000/- and generates an annual cash inflow of Rs.6,500/- for the next 3 years.

Investment 2:

This requires an initial investment (initial cost) of Rs.18,000/- and the annual cash inflow from the investment for the next 3 years is given below:

Year	1	2	3
Cash inflow (Rs.)	-	15,000	20,000

Owing to the limited resources, the company can make only one investment.

The required rate of return of the company is 9% per annum.

You are required to, advise the company to select the best investment option, using Net Present Value (NPV) method. (06 marks)

You may use the following discounting factors at 9%.

Year	1	2	3	4
Discounting Factor @ 9%	0.917	0.842	0.772	0.708

- (c) (i) Write the expansion of $(a + b)^4$ by using the Binomial theorem.
(ii) Using the result of (i) above, write the expansion of $(2x + 3)^4$. (06 marks)

- (d) The Total Profit (TP) of a Television manufacturing company is given by,

$$TP = -x^2 + 9x - 14$$

Where x is the number of units in Millions. The production capacity is within the range of 1 to 9 Million units.

- (i) Draw the Total Profit of the company on a graph paper. (*take units in Millions*)
(ii) Using the graph, show the range of number of units that the company needs to produce to make a profit. (07 marks)

(e) A person who won a lottery was given two options to get the cash prize.

Option 1: Take the cash prize as a lump sum payment of Rs.3,000,000/-.

Option 2: Take the prize in 6 annual installments of Rs.550,000/- over 6 years at the end of every year.

- If he selects the Option 1, he will deposit the money in a fixed deposit which pays $x\%$ of interest compounded annually for 6 years.
- If he selects the Option 2, he will immediately deposit the installment which he gets at the end of each year at an interest of 14% compounded annually.

In order for both options to give equal returns at the end of six(06) years, what should be the interest rate of the fixed deposit under Option 1?

(06 marks)

(Total 30 marks)

03. (a) A vehicle manufacturer intends to find the relationship between the production cost and the number of units manufactured.

The number of units manufactured monthly and its production cost are given below:

No. of vehicles manufactured (x)	21	39	48	25	75	35	60	81
Total production cost (Rs. Millions) (y)	40	58	67	45	96	53	78	102

Using the information given above:

- Present the data in a scatter diagram.
- Determine the equation of the regression line given by, $y = a + bx$.

You may use the following formula for this:

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

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

- Calculate the forecasted production cost to manufacture 100 vehicles. (12 marks)

(b) (i) State two(02) factors that should be considered when preparing an index number. (02 marks)

(ii) The table below shows details of sales of four(04) items for the years 2010 and 2012.

Item	Year 2010		Year 2012	
	Price (Rs.)	Quantity(Kg)	Price (Rs.)	Quantity (Kg)
A	20	8	40	6
B	50	10	60	5
C	40	15	50	10
D	20	20	20	15

Considering 2010 as the base year, calculate the Laspeyre's Price Index for the year 2012. (06 marks)

(Total 20 marks)

SECTION - C

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

20 marks

04. (a) Find the inverse of the matrix $A = \begin{pmatrix} 2 & -2 \\ -7 & 8 \end{pmatrix}$ (04 marks)

- (b) The following table shows age distribution of 100 workers in a company during the year 2011.

Age (years)	No. of workers
20 - 29	12
30 - 39	16
40 - 49	36
50 - 59	24
60 - 69	12

Using the data given in the table,

Calculate: (i) Mean,

(ii) Standard Deviation,

of the ages of workers.

(06 marks)

(Total 10 marks)

05. (a) A construction company intends to invest in a new project for constructing a multi storey apartment complex. According to the design, the construction cost for the ground floor is Rs.2 million. The cost of construction of each upper floor increases 1.2 times the cost of constructing the previous floor.

If the maximum investment that the company can undertake is only Rs.1,000 million, can the company design and construct a multi-storey apartment complex having 25 floors? (*show your calculations*) (05 marks)

- (b) In a factory, a product that comes from three(03) production lines A_1, A_2, A_3 are packed into boxes.

The percentage of production from each production line is as follows:

Production Line	Percentage (%) of production from the production line
A_1	30%
A_2	44%
A_3	26%

According to the past records, 1% of the production from A_1 , 3% of the production from A_2 and 2% of the production from A_3 are not in right sizes to be packed into boxes.

- (i) What is the probability that a product chosen at random from the entire batch is **not** in the right size to be packed into a box?

- (ii) If the rejections due to size differences from each production line exceed the above percentages, it will lead to reshuffling of machine operators in that line. There were 32 rejections from line A₁ in the last production batch of 10,000 (from all 3 lines).

Assess whether reshuffling of machine operators of line A1 is required.

(05 marks)

(Total 10 marks)

- 06.** (a) The Marginal Cost (MC) function of producing q units is given below:

$$MC = 20 + 48q + 15q^2$$

The fixed cost of production is Rs.1,200/-.

Find,

- (i) The Total Cost (TC) Function.
 (ii) The Variable Cost (VC) Function.
 (iii) The Average Cost (AC) Function.

(05 marks)

- (b) The following table shows the frequency distribution of monthly salaries of 200 workers in the Mechanical department of **Texico Engineering (pvt) Ltd.**

Monthly Salary (x) (Rs.'000)	Frequency (No. of workers)
$140 \leq x < 150$	15
$150 \leq x < 160$	25
$160 \leq x < 170$	35
$170 \leq x < 180$	50
$180 \leq x < 190$	40
$190 \leq x < 200$	20
$200 \leq x < 210$	15

- (i) Draw the histogram to illustrate the above data (*use a graph paper*).
 (ii) Find the Median value of Monthly salaries using the histogram.

(05 marks)

(Total 10 marks)