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THE INSTITUTE OF
CHARTERED ACCOUNTANTS
OF SRI LANKA

SUGGESTED SOLUTIONS

02104 – Business Mathematics and Statistics

Certificate in Accounting and Business I Examination
September 2014

THE INSTITUTE OF CHARTERED ACCOUNTANTS OF SRI LANKA

PAPER A

ANSWERS FOR MULTIPLE CHOICE QUESTIONS

1.

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20.

Examiners' comments

All questions were within the syllabus, and were quite appropriate.

Questions numbering 4, 11, 15, 16 and 17 had been answered properly by most of the candidates, whereas the answers to questions numbering 18 and 20 were not generally satisfactory.

Anyhow the candidates seemed to have attempted to answer all the questions which indicates their skillfulness in time management.

The candidates also seemed to have knowledge of simple probability theory and solving basic probability questions.

Candidates have not shown good knowledge in solving questions in relation to time series analysis (Questions 18 and 20).

About 60% of the candidates have secured marks between 15 and 25; and about 30% have secured marks between 25 and 30.

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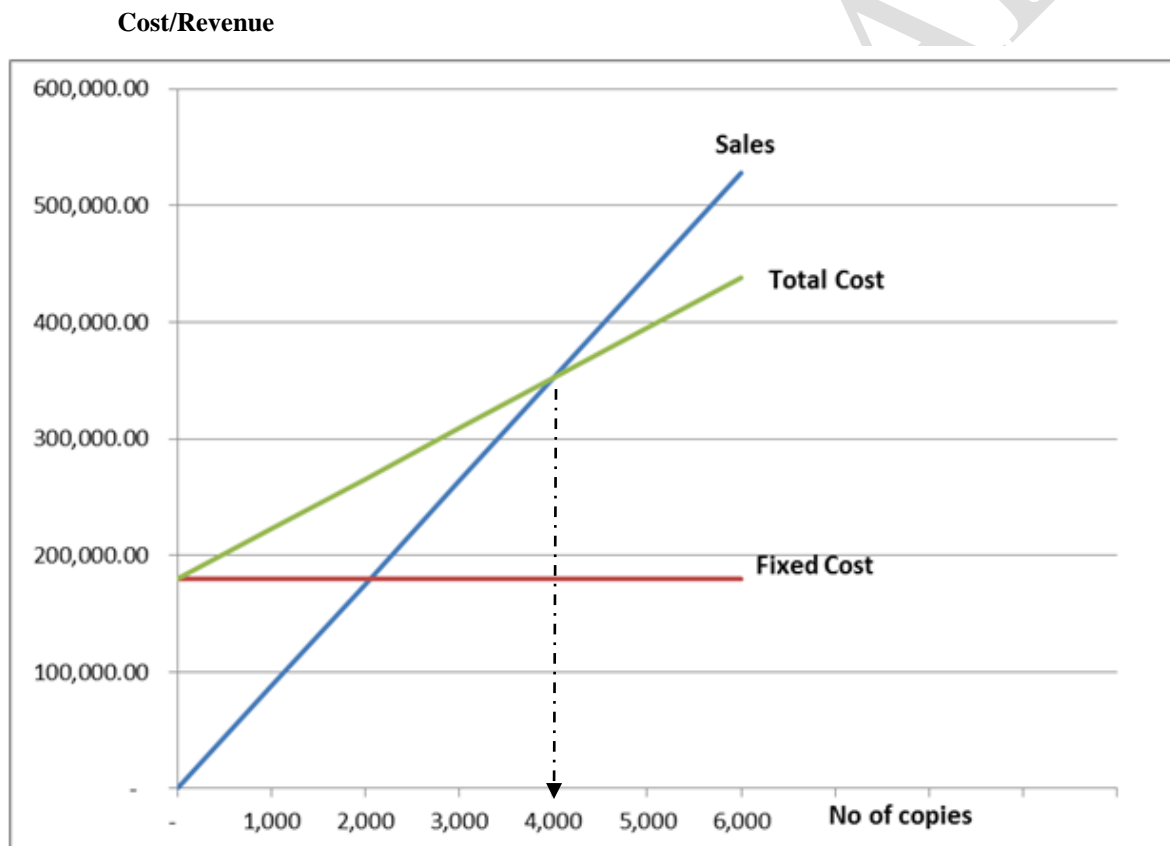
PAPER B

Answer No. 01

(a) Fixed cost = $(61 - 43) * 10,000 = \text{Rs. } 180,000$

(b)

Number of copies	-	1,000	2,000	3,000	4,000	5,000	6,000
Total sales income (Rs.)	-	88,000	176,000	264,000	352,000	440,000	528,000
Variable cost (Rs.)	-	43,000	86,000	129,000	172,000	215,000	258,000
Fixed cost (Rs.)	180,000	180,000	180,000	180,000	180,000	180,000	180,000
Total cost (Rs.)	180,000	223,000	266,000	309,000	352,000	395,000	438,000
Profit/loss (Rs.)		(135,000)	(90,000)	(45,000)	-	45,000	90,000



(c) Break even number of copies = 4,000

	Rs.
(d) Agent sales ($0.6 * 10,000 * 80$)	480,000
Direct outlet sales ($0.4 * 10,000 * 100$)	<u>400,000</u>
Total sales revenue	880,000
Total cost ($61 * 10,000$)	<u>(610,000)</u>
Profit	<u>270,000</u>

Examiners' comments

Weakness in calculating fixed costs and variable costs was observed in the answer scripts of some of the candidates; due to this weakness they were unable to identify the break-even point. They were also unable to make the graphic representation properly.

Anyway, many candidates have provided reasonably good answers to this question.

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Answer No. 02

$$(a) \quad v = \frac{P}{i} \left[(1+i)^n - 1 \right] = \frac{P}{(i/f)} \left[\left\{ 1 + \frac{i}{f} \right\}^{nf} - 1 \right]$$
$$P = 12,000, n = 4, f = 4 \quad i = 0.12 \quad = \frac{12,000}{\left\{ \frac{0.12}{4} \right\}} \left[\left\{ 1 + \frac{0.12}{4} \right\}^{4 \times 4} - 1 \right]$$
$$= \text{Rs. } 241,882.58$$

(b) (i) The concept that money available at the present time is worth more than the same amount in the future due to its potential earning capacity. In other words, it is the principle that the purchasing power of money can vary over time

(ii)

	Rs. '000					
	Y0	Y1	Y2	Y3	Y4	Y5
Investment	(1,250)					
Cash inflow		(220)	350	445	600	782
Scrap value						250
	(1,250)	(220)	350	445	600	1,032
Discount rate @ 12%	1	0.893	0.797	0.712	0.636	0.567
DCF	(1,250)	(196.46)	278.95	316.84	381.60	585.14
NPV (Rs.)						116.07

Examiners' comments

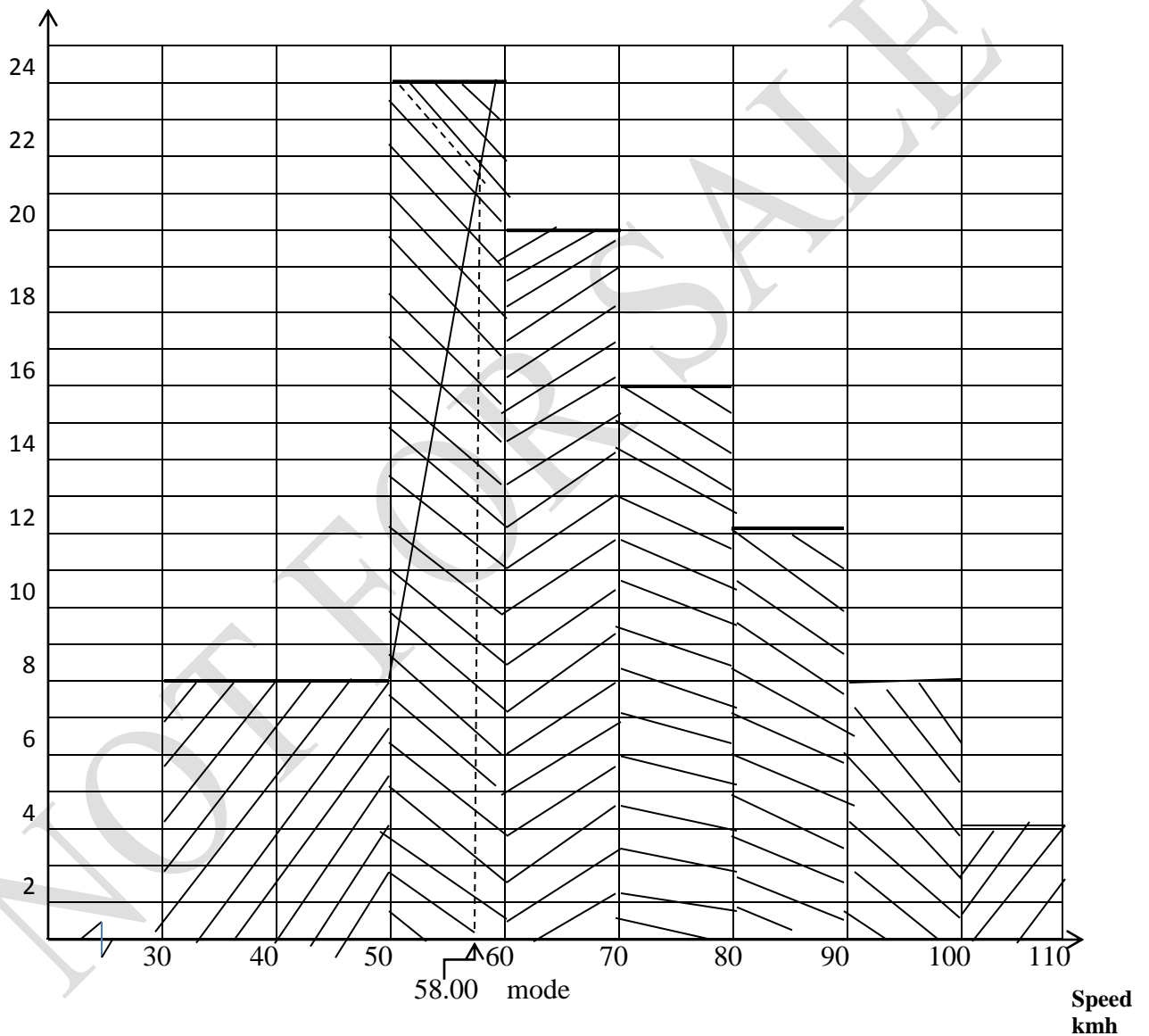
Many candidates had failed to distinguish between years and quarters in calculating annuities. They had written the annuity equation incorrectly, and could not get the interest rate as 0.03. Weaknesses in calculating the net present value were found as in previous years; there were mistakes in the application of the 'discount factor'.

Answer No. 03

- (a) Ordinal data - Condition of vehicle
Continuous data - Speed
Discrete data - Number of passengers

- (b) (i) Median class : $60 \leq x < 70$

- (ii) No of vehicles



- (iii) 40%

Examiners' comments

Many candidates had failed to provide satisfactory answers to this section. Weaknesses were noted in selecting the class intervals correctly, and in producing the histogram. Therefore, such candidates had failed to find the mode correctly.

Answer No. 04

- (a) Range
Quartile deviation
Mean deviation
Variance and standard deviation

(b)

						A = 35						
	x	f	fx	x ²	fx ²	d=x-A	fd	d ²	fd ²	u = x-A/c	fu	fu ²
0 ≤ x < 10	5	21	105	25	525	-30	-630	900	18,900	-10	-210	2,100
10 ≤ x < 20	15	12	180	225	2,700	-20	-240	400	4,800	-8	-96	768
20 ≤ x < 30	25	15	375	625	9,375	-10	-150	100	1,500	-6	-90	540
30 ≤ x < 40	35	12	420	1,225	14,700	0	0	0	0	-4	-48	192
40 ≤ x < 50	45	9	405	2,025	18,225	10	90	100	900	-2	-18	36
50 ≤ x < 60	55	13	715	3,025	39,325	20	260	400	5,200	0	0	0
60 ≤ x < 70	65	5	325	4,225	21,125	30	150	900	4,500	2	10	20
70 ≤ x < 80	75	3	225	5,625	16,875	40	120	1,600	4,800	4	12	48
	320	90	2,750	17,000	122,850	40	-400	4,400	40,600	-24	-440	3,704

(i) Mean = $\frac{\sum fx}{\sum f} = \frac{2,750}{90}$
= 30.55

OR $\bar{x} = A + \frac{\sum fd}{\sum f}$
= $35 + \frac{(-400)}{90}$
= 30.55

(ii) Variance = $\frac{\sum fd^2}{\sum f} - \left\{ \frac{\sum fd}{\sum f} \right\}^2$
= $\frac{40,600}{90} - \left\{ -\frac{400}{90} \right\}^2$
= 431.36

OR $\sigma^2 = \frac{\sum f(x - \bar{x})^2}{\sum f} = \frac{38,822}{90}$
= 431.35

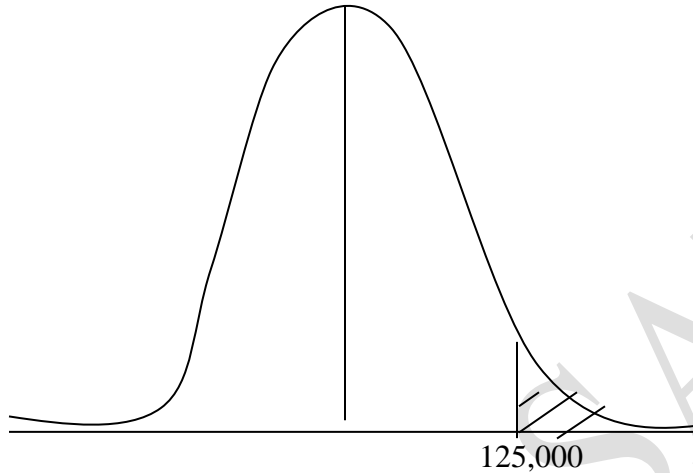
Examiners' comments

A few candidates showed lack of knowledge in variations in data. Weaknesses were also found in calculating mean and variance

Answer No. 05

- (a) Judgment sampling
Convenience sampling
Quota sampling

- (b) (i)



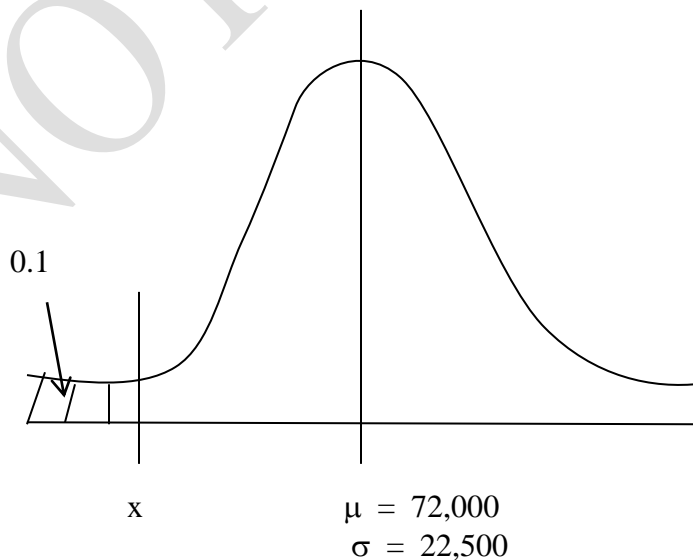
$$\begin{aligned}\mu &= 72,000 \\ \sigma &= 22,500\end{aligned}$$

$$Z = \frac{125,000 - 72,000}{22,500} = 2.355$$

$$\begin{aligned}\text{Area} &= 0.5 - 0.4906 \\ &= 0.0094\end{aligned}$$

% of salaries as directors salaries = 0.94%

- (ii)



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

$$Z \Rightarrow -1.28$$

$$-1.28 = \frac{x - 72,000}{22,500}$$

$$x = 43,200$$

Maximum salary of a casual worker = Rs. 43,200

(c) $N = 20,000$ $n = 10$

Probability of a defective lens = $\frac{1}{500}$

$$m = np = 10 \times \frac{1}{500} = \frac{1}{50} (0.02)$$

Number of packets containing no defective lens
= $20,000 \times 0.9802 = 19,604$

Number of packets containing one defective lens
= $20,000 \times 0.9802 \times 0.02 = 392$

Number of packets containing two defective lenses
= $\frac{20,000 \times 0.9802 \times (0.02)^2}{2} = 3.9208 = 4$

Number of packets containing three defective lenses
= $\frac{20,000 \times 0.9802 \times 0.02^3}{3 \times 2} = 0.026 = 0$

Hence number of packets containing four defective lenses is also zero.

Examiners' comments

It was noted that candidates generally showed lack of knowledge in sampling theory.

Answer No. 06

- (a) Based on the test results when we decide to accept a null hypothesis when it is false, it is a type II error.

Type II error - Accept H_0 when it is false.

- (b) Sample size $n = 50$

Sample mean $\bar{x} = 1,510$

Population SD = 110

We can state the null and alternative hypothesis as:

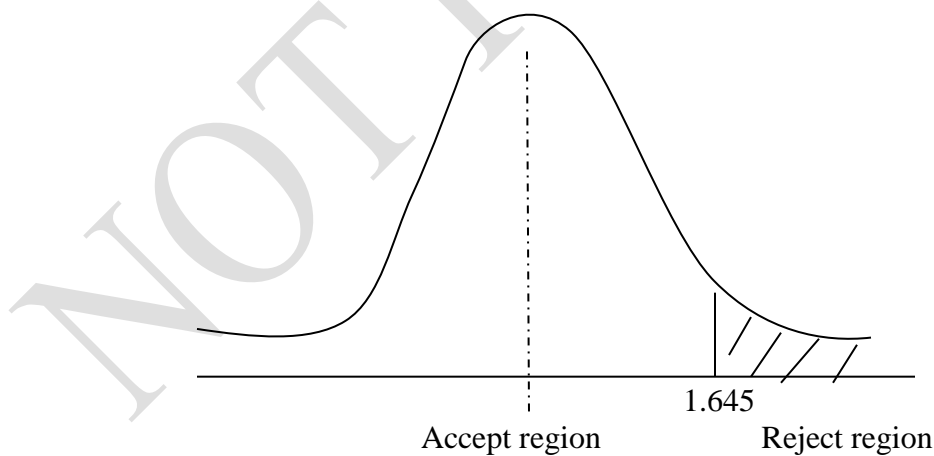
H_0 : $\mu = 1,450 \Rightarrow$ the mean breaking strength of the new rod is 1,450 pounds.

H_1 : $\mu > 1,450 \Rightarrow$ the mean breaking strength of the new rod is more than 1,450 pounds.

This is a one tail test.

From tables at 5% significance

$$Z_{0.05} = 1.645$$



$$Z_1 = \frac{\bar{x} - \mu_0}{\sigma} = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$$

$$\begin{aligned} &= \frac{1,510 - 1,450}{\frac{110}{\sqrt{50}}} \\ &= \frac{60}{15.55} \\ &= 3.85 \end{aligned}$$

The value lies in the reject region $\therefore H_0$ is rejected at 5% level of significance

\therefore The strength of new steel rods is greater than 1,450 pounds.

Examiners' comments

About 50% of the candidates did not attempt this question, while some candidates failed to provide the answer fully. Many candidates were not able to explain the Type II error. Candidates were also unable to identify the correct test type (whether 'one-tailed' or 'two-tailed'). They also showed weakness in calculating the standard error (a few candidates had calculated the standard error using sample means for each distribution separately).

Answer No. 07

(a)

x	y	xy	x ²	y ²
2	4	8	4	16
5	3	15	25	9
8	6	48	64	36
10	8	80	100	64
12	12	144	144	144
15	10	150	225	100
18	15	270	324	225
20	16	320	400	256
90	74	1,035	1,286	850

$$\bar{x} = 90/8 = 11.25$$

$$\bar{y} = 74/8 = 9.25$$

$$b = \frac{\sum xy - n \bar{x} \bar{y}}{\sum x^2 - n(\bar{x})^2}, \quad \text{OR} \quad \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}$$

$$b = (1,035 - (8 * 11.25 * 9.25)) / (1,286 - (8 * 11.25 * 11.25))$$

$$b = 0.74$$

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

$$a = 9.25 - 0.74 * 11.25$$

$$= 0.92$$

Regression equation $y = 0.92 + 0.74x$

(b) Correlation coefficient

$$\begin{aligned} r &= \frac{n \sum xy - \sum x \sum y}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}} \\ &= \frac{(8 * 1035) - (90 * 74)}{\sqrt{[8 * 1286 - (90)^2][8 * 850 - (74)^2]}} \\ &= 1620 / \sqrt{2188 * 1324} \\ &= 0.9518 \end{aligned}$$

The two variables have a strong positive correlation

Examiners' comments

Most of the candidates seemed to have understood this question well. However, about 20% of the candidates failed to calculate the correlation coefficient. A few candidates had attempted to find the rank correlation coefficient instead of Carl-Pearson correlation coefficient.

Answer No. 08

(a)

Production '000 (Y)	4Q moving total		4 quarter centered Moving Average (T)	Fluctuation (Y-T)
24				
32	112			
16	116	228	28.5	-12.50
40	120	236	29.5	10.50
28	126	246	30.75	-2.75
36	130	256	32	4.00
22	132	262	32.75	-10.75
44	133	265	33.125	10.88
30	136	269	33.625	-3.63
37	138	274	34.25	2.75
25	142	280	35	-10.00
46	146	288	36	10.00
34	151	297	37.125	-3.13
41	157	308	38.5	2.50
30				
52				

	Q1	Q2	Q3	Q4
			-12.50	10.50
	-2.75	4.00	-10.75	10.88
	-3.63	2.75	-10.00	10.00
	-3.13	2.50		
Total	(9.50)	9.25	(33.25)	31.38
Unadjusted mean	(3.17)	3.08	(11.08)	10.46
Adj	0.18	0.18	0.18	0.18
Seasonal fluctuation	(2.99)	3.26	(10.91)	10.64

(b)

Item	Base year (2010)		2014		PnQn	p0qn
	Price (Rs)	Quantity	Price (Rs)	Quantity		
	p0	Q0	Pn	Qn		
Sugar	72	4	84	4.5	378	324
Milk powder	230	3	329	3	987	690
Flour	55	4.5	82	5	410	275
Fish	132	2.5	180	3	540	396

2315

1685

$$\begin{aligned} \text{Paasche price index for 2014} &= \frac{\sum P_n Q_n}{\sum P_0 Q_n} \times 100 \\ &= (2,315/1,685) \times 100 \\ &= 137.38 \end{aligned}$$

Examiners' comments

More than 50% of the candidates have shown weakness in time series analysis. Candidates also showed weakness in using the appropriate formulae in calculating index numbers.

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