THE INSTITUTE OF CHARTERED ACCOUNTANTS OF SRI LANKA

SUGGESTED SOLUTIONS

02104 – Business Mathematics and Statistics

Certificate in Accounting and Business I Examination
March 2013

THE INSTITUTE OF CHARTERED ACCOUNTANTS OF SRI LANKA

PAPER 'A'

ANSWERS FOR MULTIPLE CHOICE QUESTIONS

1.	**3**	11.	**3**
2.	**2**	12.	**4**
3.	**3**	13.	**1**
4.	**3**	14.	**4**
5.	**2**	15.	**4**
6.	**1**	16.	**2**
7.	**3**	17.	**4**
8.	**4**	18.	**1**
9.	**2**	19.	**3**
10.	**1**	20.	**2**

Answer No. 01

		Y1	Y2	Y3	Y4	Y5
(a)	Electricity cost (Rs.)	4,000,000.00	4,100,000.00	4,202,500.00	4,307,562.50	4,415,251.56
(b)	Savings	8%	8%	8%	8%	8%
		320,000.00	328,000.00	336,200.00	344,605.00	353,220.13
(c)	DCF	0.87	0.756	0.658	0.572	0.497
	PV (Rs.)	278,400.00	247,968.00	221,219.60	197,114.06	175,550.40
						1,120,252.06
	NPV of the investment = 1,120,252.06 - 1,000,000 =					**Rs. 120,252.06**
(d)	NPV of the energy saving is positive, hence the project is viable. Recommend to replace the 2nd dryer					

(Total 12 marks)

Answer No. 02

(a) Average income per room per day = (56,000 x 0.25) + (48,000 x 0.75)

= 14,000 + 36,000

= Rs. 50,000 (2 marks)

(b) Assume that the number of rooms booked would be x

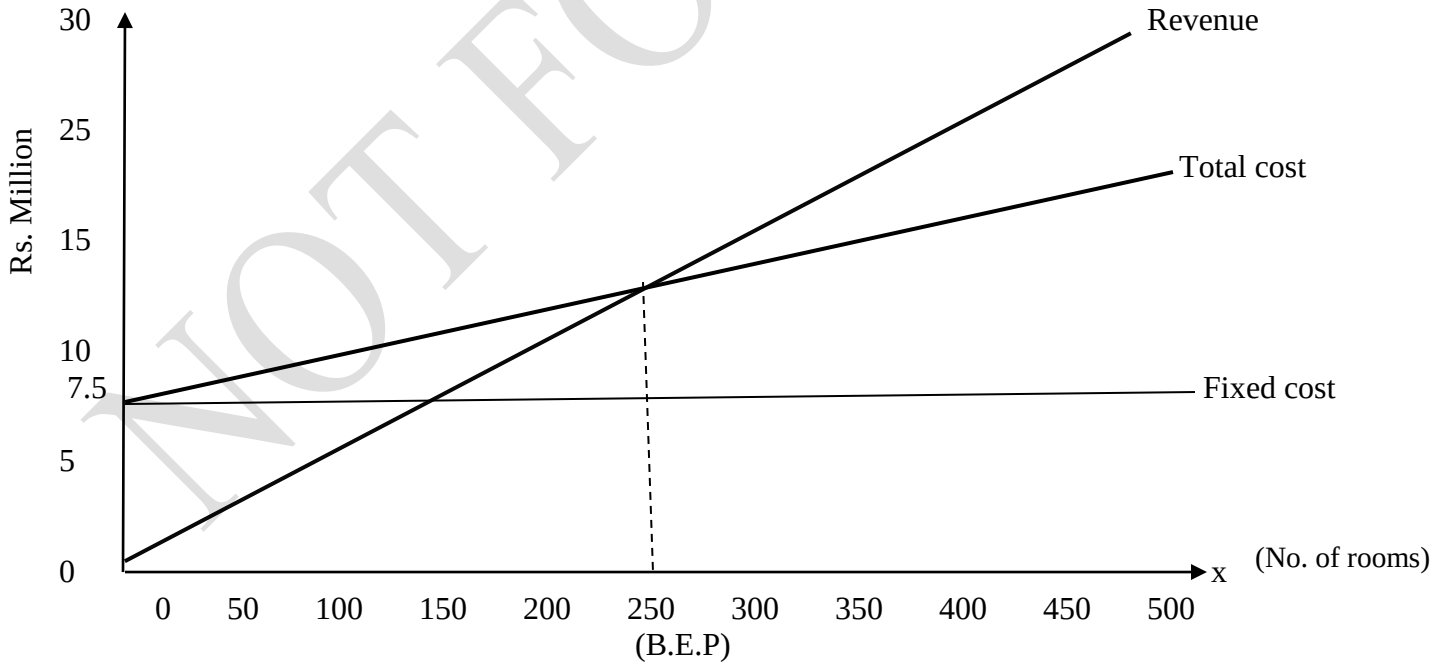
Revenue $\Rightarrow$ R = 50,000 x

Total Cost $\Rightarrow$ TC = 20,000 x + 7,500,000 (2 marks)

(c)

(Rs. 'Mn)

x	0	100	200	300	400	500
Revenue	0	5.0	10.0	15.0	20.0	25.0
Variable cost	0	2.0	4.0	6.0	8.0	10.0
Fixed cost	7.5	7.5	7.5	7.5	7.5	7.5
Total cost	7.5	9.5	11.5	13.5	15.5	17.5



Break even occupancy rate = 250 rooms per day (5 marks)

(d) Duration of the power failure = 24 hours

Additional FC = 62,500 x 24
= 1,500,000
Total FC = 9,000,000

Assume new B.E level is x

50,000x = 20,000x + 9,000,000
30,000x = 9,000,000
x = 300

B.E occupancy rate = 300 rooms

(3 marks)

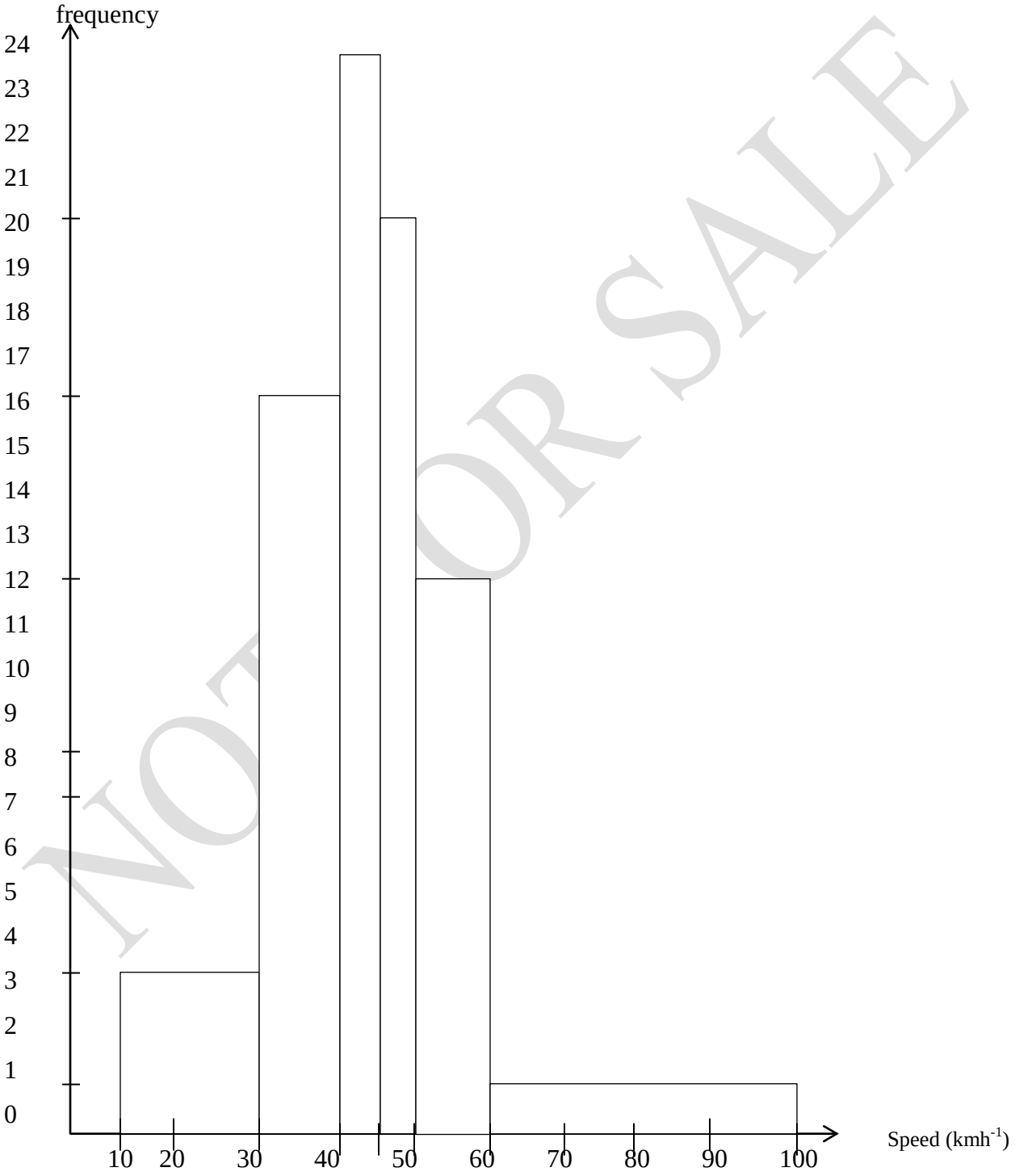
(Total 12 marks)

Answer No. 03

(a) The number of road accidents shown in 2000 is 800, but in 2010 is 500. The figure is not halved.

(2 marks)

(b)



(6)

V	$10 < V \leq 30$	$30 < V < 40$	$40 < V < 45$	$45 < V < 50$	$50 < V < 60$	$60 < V < 100$
f	6	16	12	10	12	4
Cum. f	6	22	34	44	56	60
Std. f	3	16	24	20	12	1

(3 marks)

(ii) Model class = 40 - 45 (1 marks)

(iii) Upper quartile of the distribution = 60 x 75 % = 45
= 50 kmh^{-1} to 60 kmh^{-1}

(2 marks)

(iv) (a) P (less than 10 kmh^{-1}) = 0 (2 marks)

(b) P (more than 50 kmh^{-1}) = $\frac{16}{60} = \frac{4}{15}$

(2 marks)

(Total 12 marks)

Answer No. 04

						Alternate Answer			
						A = 45			
	x	**f**	**fx**	**x^2**	**fx^2**	**d=x-A**	**fd**	**d^2**	**fd^2**
10 and less than 20 days	15	3	45	225	675	-30	-90	900	2700
20 and less than 30 days	25	8	200	625	5000	-20	-160	400	3200
30 and less than 40 days	35	19	665	1225	23275	-10	-190	100	1900
40 and less than 50 days	45	24	1080	2025	48600	0	0	0	0
50 and less than 60 days	55	37	2035	3025	111925	10	370	100	3700
60 and less than 70 days	65	18	1170	4225	76050	20	360	400	7200
70 and less than 80 days	75	7	525	5625	39375	30	210	900	6300
80 and less than 90 days	85	4	340	7225	28900	40	160	1500	6400
	400	120	6060	24200	333800	40	660	440	31400

(a) **Method I**

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$= \frac{6060}{120}$$

$$= 50.5$$

Method II

$$\text{Mean} = \frac{\Sigma fd}{\Sigma f}$$

$$= 45 + \frac{660}{120}$$

$$= 50.5$$

(4 marks)

(b) $$\text{S.D} = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - (x)^{-2}}$$

$$= \sqrt{\frac{333,800}{120} - 50.5^2}$$

$$= 15.21$$

$$\text{S.D} = \sqrt{\frac{\Sigma fd^2}{\Sigma f} - \left(\frac{\Sigma fd}{\Sigma f}\right)^2}$$

$$= \sqrt{\frac{31,400}{120} - \left(\frac{660}{120}\right)^2}$$

$$= 15.21$$

(5 marks)

(c) Coefficient of variations $$= \frac{\text{S.D}}{\text{Mean}}$$

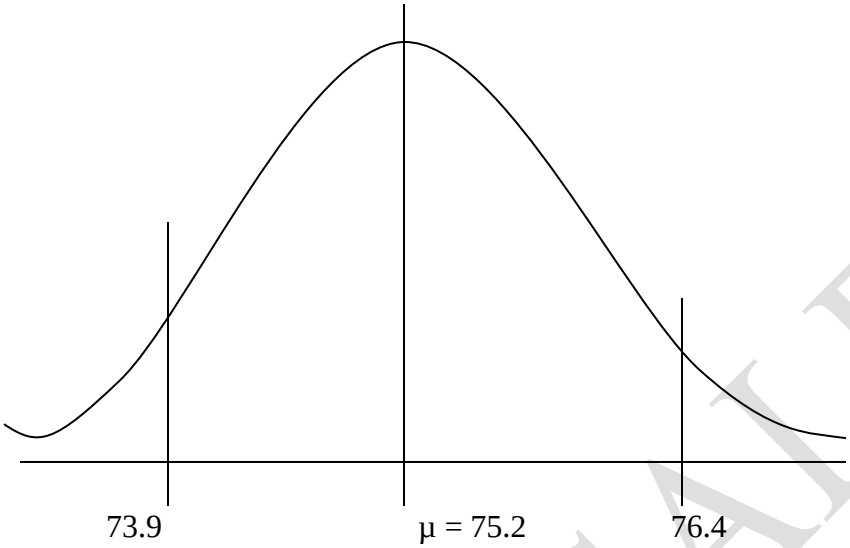
$$= \frac{15.21}{50.5} \times 100$$

$$= 30.12\%$$

(3 marks)
(Total 12 marks)

Answer No. 05

(a)



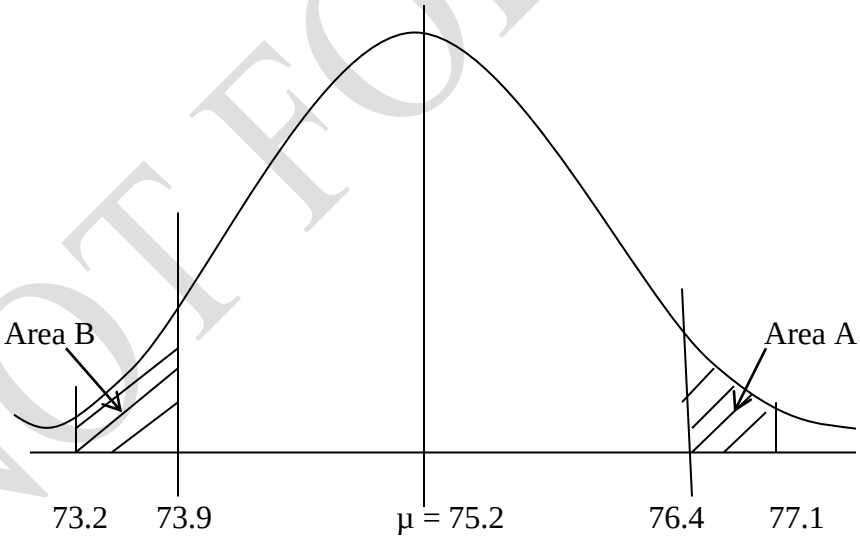
$Z_1 = \frac{76.4 - 75.2}{0.9} = 1.33$ $\qquad$ $Z_2 = \frac{75.2 - 73.9}{0.9} = -1.44$

Area re : Z_1 = 0.4082 $\qquad$ Area re : Z_2 = 0.4251

(3 marks)

Total percentage within 73.9mm - 76.4mm = 83.33%

(b)



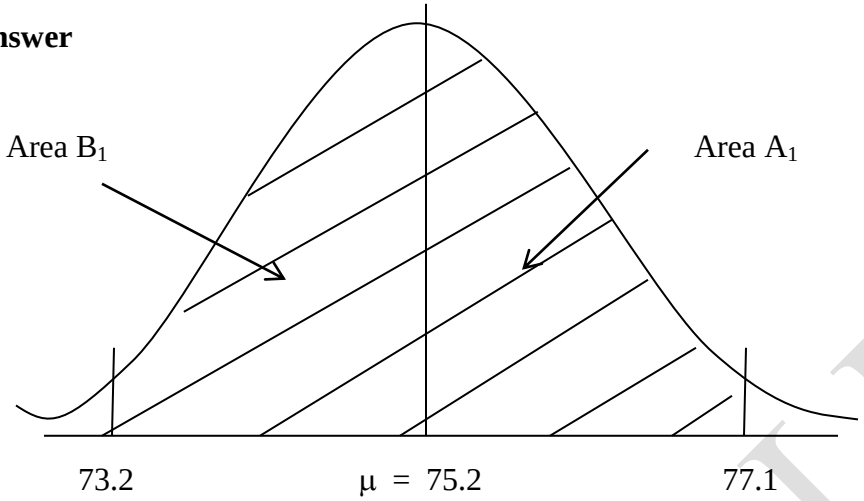
$Z_1 = \frac{77.1 - 75.2}{0.9} = 2.11$ $\qquad$ $Z_2 = \frac{73.2 - 75.2}{0.9} = -2.22$

Area re : A = 0.4826 - 0.4082 = 7.44% $\qquad$ Area re : B = 0.4868 - 0.4251 = 6.17%

% of component which undergo the additional mechanical process = 7.44% + 6.17%
= 13.61%

(5 marks)

Alternate Answer



Area A_1 = 0.4826 earlier std (Area re : $Z_1 + Z_2$) = 0.8333
Area B_1 = 0.4868 ∴ difference = 0.9694 – 0.8333
0.9694 = 13.61%

(c) (i) % components are "Too Small" = 0.5 - 0.4868

= 1.32%

of components = 132

(ii) % components expected to be undergone the mechanical process = 13.61%

= 13.61 x 10,000

No. of components = 1361

Additional cost = 1361 x 48

= Rs. 65,328

(4 marks)
(Total 12 marks)

Answer No. 06

(a) Type I error α = Reject null hypothesis when it is true
Type II error β = Accept null hypothesis when it is false (3 marks)

(b)

Air Alfa			Air Beta		
η_1	=	50	η	=	50
$\bar{x}_1$	=	3.56	$\bar{x}_2$	=	3.64
$\bar{\sigma}$	=	0.08	σ	=	0.12

Population mean = μ_1 Population mean = μ_2

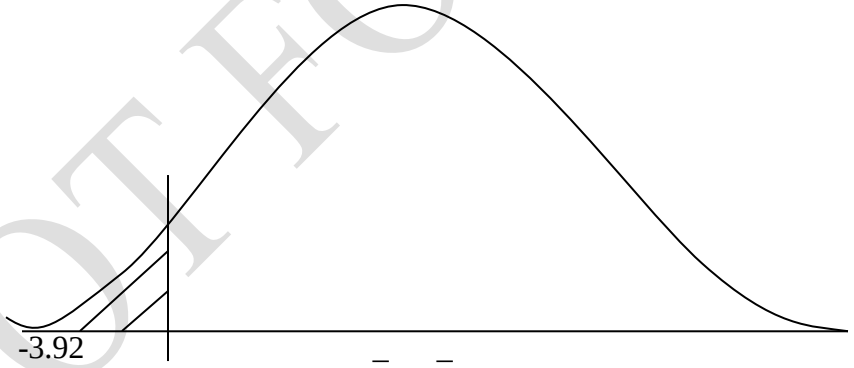
(i) Null Hypothesis = H_0 : $\mu_1 = \mu_2$
Alternative Hypothesis = H_1 : $\mu_1 < \mu_2$; $\mu_1 - \mu_2 < 0$ (3 marks)

(ii) Standard error of mean = $\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$

$= \sqrt{\frac{0.08^2}{50} + \frac{0.12^2}{50}}$

$= 0.020$ (2 marks)

(iii)



$Z_1 = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$

$Z_1 = \frac{\bar{x}_1 - \bar{x}_2}{0.020}$

$= \frac{3.56 - 3.64}{0.020}$

$= -3.92$

Z_1 = $-3.92 < Z_1 = 2.33$ at 0.01 level of significance
Air Beta takes more time than Air Alfa, i.e. Air Alfa is more punctual than Air Beta

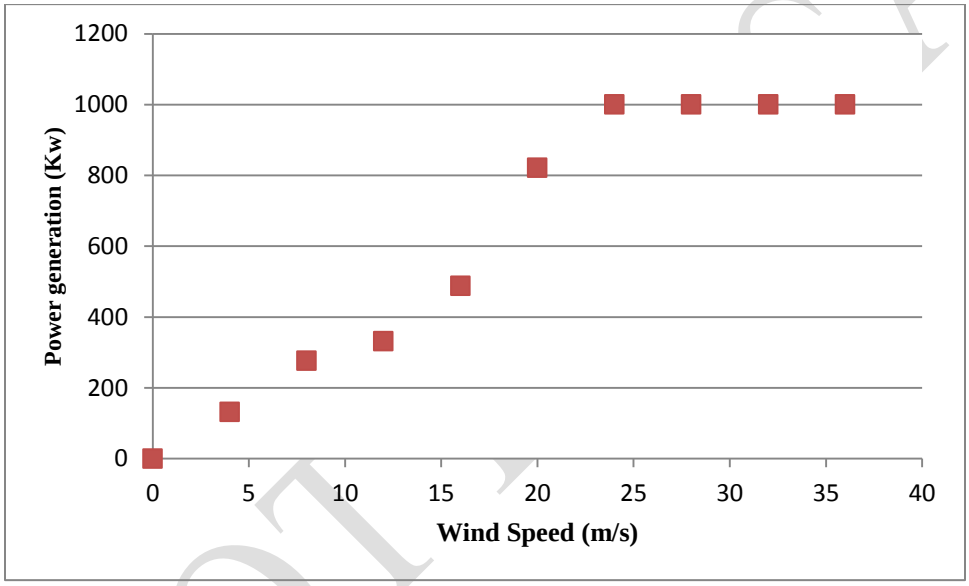
(4 marks)

(Total 12 marks)

Answer No. 07

(a)

Wind Speed	Power generation of the wind turbine (kw)
0	0
4	132
8	276
12	332
16	488
20	821
24	1000
28	1000
32	1000
36	1000



(3 marks)

(b) Upto 24 m/s - strong positive correlation (2 marks)

x	y	x^2	Y^2	XY
0	0	0	0	0
4	132	16	17424	528
8	275	64	75625	2200
12	332	144	110224	3984
16	488	256	238144	7808
20	821	400	674041	16420
24	1000	576	1000000	24000
84	3048	1456	2115458	54940

(12)

Correlation (r) = $n\Sigma XY - (\Sigma X)(\Sigma Y) / \text{Sqrt}[(n\Sigma X^2 - (\Sigma X)^2][(n\Sigma y2 - (\Sigma Y)^2)]$

$$= \frac{7(54{,}940) - (84)(3048)}{\sqrt{7\left((1456) - (84)^2\right)\quad\left((7(2{,}115{,}458) - (3{,}048)^2\right)}}$$

$$= \frac{128{,}548}{\sqrt{3{,}136 \times 5{,}517{,}902}}$$

$$= 0.977$$

$$\simeq 0.98$$

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Two variables have a strong positive correlation

(c) Coefficient of determination $\left(r^2\right) = 0.954$

i.e. 95.4% of the variation in power generation of the wind turbine can be accounted for by linear relationship with wind speed.

(7 marks)
(Total 12 marks)

Answer No. 08

(a) $\frac{2011}{2010} = 101.8\% = 1.018$

and $\frac{2012}{2010} = 103.3\% = 1.033$

$\therefore \frac{2012}{2010} = \frac{2012}{2011} \times \frac{2011}{2010} = 1.033 \times 1.018$

$= 1.051594$

$= 105.2\%$

$\therefore$ Price index for 2012 based on 2010 = 105.2

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(4 marks)

(b)

Category	2012 Price Index (%)	Weight *(W)*	Price Index x *(W)*
Food	106.7	163	17392.1
Catering	113.4	50	5670
Alcoholic Drink	109.4	78	8533.2
Tobacco	106.6	36	3837.6
Housing	118.3	160	18928
Fuel and light	101.6	55	5588
Clothing and footwear	105.2	72	7574.4
		$\sum W = 614$	**67523.3**

Weighted Price Index $= \frac{67523.3}{614} = 109.97$

$= \sim 110$

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(5 marks)

(c) Weekly expenditure 2012 $= \approx 110\%$ if expenditure 2010

$= 1.10 \times$ Euro 1250

= Euro 1375.00

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(3 marks)

(Total 12 marks)

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