THE INSTITUTE OF CHARTERED ACCOUNTANTS OF SRI LANKA

No. of Pages - 10
No. of Questions -09

SCHOOL OF ACCOUNTING AND BUSINESS
BSc. (APPLIED ACCOUNTING) GENERAL/SPECIAL DEGREE PROGRAMME 2013/14

YEAR I SEMESTER II
END SEMESTER EXAMINATION – MAY 2014

QMT 10230 Business Statistics

Date	:	28th May 2014
Time	:	9.00 a.m. – 12.00 p.m.
Duration	:	Three (03) hours

Instructions to Candidates:

- Answer any six (06) questions.
- The total marks for the paper is 100.
- All questions carry equal marks.
- Use of scientific calculator is allowed.
- Standard Normal Table and Formula Sheets are provided.
- Graph Papers are provided on request.
- Answers should be written neatly and legibly.

Question No. 01

In order to determine a realistic price for a new product that a company wishes to market, the company's research department selected 10 sites having essentially identical sales potential and offered the product in each at a different price. The resulting sales are recorded in the following table:

Location	Price	Sales (000)
A	15.00	15
B	15.50	14
C	16.00	16
D	16.50	09
E	17.00	12
F	17.50	10
G	18.00	08
H	18.50	09
I	19.00	06
J	19.50	05

i. Draw a scatter diagram after identifying the Predictor and Response variables
ii. Does it appear that a straight-line model is reasonable?
iii. Find the correlation coefficient of the variables given and interpret it.
iv. If it is reasonable, find the least squares regression line to predict the sales in terms of price.
v. Interpret the regression model you developed in Question (iv).
vi. If the price is scheduled at $18.00, what would be the expected sales?
vii. What is the validity of your forecast in Question (vi)

Question No. 02

i. A bulb manufacturer states that the bulbs they produce have a mean lifetime of 2000 hours with a standard deviation of 150 hours. In general, it can be assumed that the lifetime of bulbs follows a Normal Distribution

   a. If a bulb is selected at random, what is the probability that it has a lifetime less than 1900 hours?
   b. If a bulb is selected at random, what is the probability that it has a lifetime more than 1950 hours?
   c. What percentage of the bulbs will last more than 2100 hours?
   d. If the manufacturer wishes to replace 10% of the bulbs free of charge, what should be the warranty period printed on the pack of the bulb?

ii. The number of road construction projects that take place at any time in a certain city follows a Poisson Distribution with a mean of 3. Find the probability that exactly five road construction projects are currently taking place in this city.

Hint : $\Pr[\, X = x \,] = \frac{e^{-\lambda}\lambda^{x}}{x!}$

Question No. 03

i. The chance that a harvest is poorer than average is 0.4, but if it is known that a certain disease *D* is present, this probability increases to 0.7. The disease *D* is present in 35% of the harvests. Find the probability that, when the harvest is observed to be poorer than average, the disease *D* is present.

ii. A decision maker is faced with the following three options, which result in the profits shown. If the intention is to maximize the expected profit, which option should be chosen as the best?

	High sales	Medium Sales	Low Sales
	p = 0.5	p = 0.4	p = 0.1
Option A	$ 70,000	$ 20,000	- $ 55,000
Option B	$ 50,000	$ 15,000	- $ 25,000
Option C	$ 35,000	$ 20,000	-

Question No. 04

i. In a production company the quality control manager asks his assistant to check the quality of all the items produced by the three shifts at one of their factories during a certain day and divided into three groups as Grade I, Grade II and Faulty. A summary of the observations produced to the manager is given below. The manager needs your help to find the following probabilities:

	Shift A	Shift B	Shift C
Grade I	74	86	77
Grade II	63	68	41
Faulty	11	17	08

If an item is selected at random, what is the probability that

a. It was produced by shift A
b. It was produced by shift A or is Grade I
c. It is Grade I given that it was produced by shift B
d. It is from shift C, given that it is Grade II
e. It is not faulty

ii. The probability of a married woman of age 30 being alive in 30 years' time is 0.65. Similarly, the probability of a married man of age 33 being alive in 30 years' time is 0.55. Calculate, for a married couple (woman, aged 30; man, aged 33), the probabilities that in 30 years' time

a. They are both alive
b. Only one is alive
c. Neither is alive

Question No. 05

i. The profits of each shop in a particular area were obtained and summarized below at the request of the municipal council of that area.

Profit per shop (000's) Rs.	100-200	200-300	300-400	400-500	500-600	600-700	700-800
Number of Shops	10	18	20	26	30	28	18

The municipal council needs two statistical measures to be calculated and asks your help to find the mean and standard deviation of profits

ii. The average rainfall of a city from Monday to Saturday is 0.43 inch. Due to heavy rainfall on Sunday, the average rainfall for the week increased to 0.68 inch. What was the rainfall on Sunday?

Question No. 06

i. The numbers of fully formed apples on 100 plants were counted with the following results:

Number of Plants	2	5	7	11	18	24	12	8	6	4	3
Number of Apples	0	1	2	3	4	5	6	7	8	9	10

a. How many apples were there in all?
b. What was the average of number of apples per plant?
c. What was the standard deviation of the number of apples per plant?
d. What was the modal number of apples?

ii. The average monthly sales for the first eleven months of the year in respect of a certain salesman were Rs.12,000 but due to his illness during the last month, the average

monthly sales for the whole year came down to Rs.11,375. What was the value of his sales during the last month?

iii. Government statistics on the basic weekly wages of workers in two countries show the following:

	Mean	Standard Deviation
Country V	135	60
Country W	95	55

Can we conclude that country V has a wider spread of the basic weekly wage?

Question No. 07

i. The prices for six food items are given in the following table. The table also includes the number of units of each consumed by a typical family in 2012 and 2013. Determine the weighted price indices using the

a. Laspeyres Index
b. Passche Index
c. Fisher Index

Item	**2012**		**2013**	
	Price	**Quantity**	**Price**	**Quantity**
Bread (loaf)	55	50	65	55
Eggs (dozen)	132	26	204	20
Milk (litre)	110	102	130	130
Apple (red, 500 g)	360	30	470	40
Orange juice (350 ml)	470	40	540	42
Coffee (100% ground roast, 400 g)	340	12	420	12

ii. The time (in seconds) achieved by the 6 fastest runners in the 100 m sprint at a school athletic meet is listed below:

11.2, 12.3, 11.2, 11.9, 12.7, 11.6

a. Find the mean time to finish the 100 m sprint.
b. Find the variance and the standard deviation of the time.
c. Find Mean Absolute Deviation of the time.

Question No. 08

i. A random sample of 100 Business School staff was surveyed and the survey showed that the mean salary of the Business School staff was £3,000 with a standard deviation of £ 500. Estimate the population mean salary at 95% confidence level

ii. The random sample of 100 staff above also shows that 40 of them have joined the Union. Estimate the population proportion of staff joining the Union at 99% confidence level

iii. It is believed that the mean salary of the Business School staff has increased as compared to that of last year's population mean salary of £ 2,800. Using the sample data in part (i) above, test whether the mean salary has increased or not at the 5% level of significance.

iv. It is said that the number of staff joining the Union has decreased as compared to last year's population proportion of 35%. Using the sample data in part (ii) above, test whether the proportion of staff joining the Union has decreased or not at the 1% level of significance.

Question No. 09

The following table provides a summary of the total quarterly production (in 000's) in a factory in an area monitored for the past four years:

Year	Q1	Q2	Q3	Q4
2011	57	67	64	74
2012	57	69	65	78
2013	58	70	65	80
2014	59	-	-	-

From past experience it is observed that the trend of production is non-linear. The factory needs your help to analyze the data obtained to identify the seasonal effects in the four quarters.

i. Briefly explain the four components defined in time series and the basic models available in a time series.
ii. Suggest the best approach to find the trend of production.
iii. Using the approach you mentioned in part (i), find the trends
iv. With an appropriate argument choose the best model and find the seasonal components.
v. Adjust the seasonal components you found in part (iv).
vi. Interpret the seasonal components you found in part (v).
vii. If the forecasted trends for the last three quarters of the year 2014 are 70, 80 and 100 respectively, forecast the production for the last three quarters of the year 2014, using an appropriate forecasting model.
viii. Find the deseasonalized figures of the given quarterly production figures using the seasonal components you have calculated in part (iv)

FORMULA SHEET

$$\bar{X} = \frac{\sum X}{n} \qquad \bar{X} = \frac{\sum fX}{\sum f}$$

$$SD = \sqrt{\frac{\sum (X - \bar{X})^2}{n-1}} \qquad SD = \sqrt{\frac{\sum f(X - \bar{X})^2}{\sum f - 1}}$$

$$MAD = \frac{1}{n}\sum |X - \bar{X}| \qquad MAD = \frac{\sum f\ |X - \bar{X}|}{\sum f}$$

$$C.V. = \frac{SD}{Mean} \times 100$$

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{\left[n\sum x^2 - (\sum x)^2\right] \times \left[n\sum y^2 - (\sum y)^2\right]}} \qquad Coefficient\ of\ Determination = 100\, r^2$$

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

$$\Pr[A \cup B] = \Pr[A] + \Pr[B] - \Pr[A \cap B] \qquad \Pr[A'] = 1 - \Pr[A]$$

$$\Pr[A \cap B] = \Pr[A] \times \Pr[B] \qquad \Pr[A|B] = \frac{\Pr[A \cap B]}{\Pr[B]}$$

$$\Pr[X = x] = {}^{n}C_x p^x (1-p)^{n-x} \qquad \Pr[X = x] = \frac{e^{-\lambda}\lambda^x}{x!}$$

$$E[X] = \sum x \Pr[X = x]$$

$$Z = \frac{\bar{X} - \mu_0}{\left(\frac{\sigma}{\sqrt{n}}\right)}$$

$$T = \frac{\bar{X} - \mu_0}{\left(\frac{s}{\sqrt{n}}\right)}$$

$$Z = \frac{(\bar{X}_1 - \bar{X}_2) - \mu_d}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$T = \frac{(\bar{X}_1 - \bar{X}_2) - \mu_d}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$T = \frac{(\bar{X}_1 - \bar{X}_2) - \mu_d}{S_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$S_P^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}$$

$$Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$$

$$\bar{X} \pm Z_{\frac{\alpha}{2}}\left\{\frac{\sigma}{\sqrt{n}}\right\}$$

$$\bar{X} \pm t_{\frac{\alpha}{2},n-1}\left\{\frac{s}{\sqrt{n}}\right\}$$

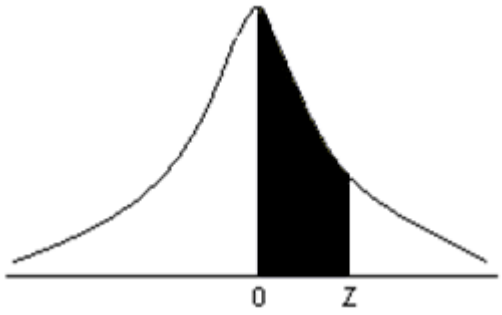
$$\hat{p} \pm Z_{\frac{\alpha}{2}}\sqrt{\frac{\hat{p}\hat{q}}{n}}$$

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

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

$$P_F = \sqrt{P_L \times P_P}$$

STANDARD NORMAL TABLE



	0.00	**0.01**	**0.02**	**0.03**	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.09**
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.49865	0.49869	0.49874	0.49878	0.49882	0.49886	0.49889	0.49893	0.49896	0.49900
3.1	0.49903	0.49906	0.49910	0.49913	0.49916	0.49918	0.49921	0.49924	0.49926	0.49929
3.2	0.49931	0.49934	0.49936	0.49938	0.49940	0.49942	0.49944	0.49946	0.49948	0.49950
3.3	0.49952	0.49953	0.49955	0.49957	0.49958	0.49960	0.49961	0.49962	0.49964	0.49965
3.4	0.49966	0.49968	0.49969	0.49970	0.49971	0.49972	0.49973	0.49974	0.49975	0.49976
3.5	0.49977	0.49978	0.49978	0.49979	0.49980	0.49981	0.49981	0.49982	0.49983	0.49983