No. of Pages - 10
No of Questions - 08

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

YEAR I SEMESTER I (Group B)
END SEMESTER EXAMINATION – MARCH 2015

QMT 10230 Business Statistics

Date	:	13th March 2015
Time	:	5.30 p.m. – 8.30 p.m.
Duration	:	Three (03) Hours

Instructions to Candidates:

- Answer only **FIVE** (05) 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

I. The following summery is prepared based on a Quality Check which categorizes all the items produced by three Production Lines (**P1, P2** and **P3**) in a factory into three grades (**G1, G2** and **G3**) during a certain day.

	P1	**P2**	**P3**	**Total**
G1	20	25	35	**80**
G2	15	20	30	**65**
G3	30	15	10	**55**
Total	**65**	**60**	**75**	**200**

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

a. It is grade **G1**.
b. It was produced by Production Line **P1** or is of Grade **G2**.
c. It was produced by Production Line **P2** and is of Grade **G3**.
d. It is Grade **G3** given that it was produced by Production Line **P3**.
e. It was from Production Line **P3**, given that it is Grade **G2**.

II. Suppose you are to select the best project proposal for a client out of three project proposals you have receive as follows.

Project Proposal A :

A profit of Rs. 2,000 with a probability of 0.5 or else a loss of Rs. 500.

Project Proposal B :

A profit of Rs. 800 with a probability of 0.3 or else a profit of Rs. 500.

Project Proposal C :

A profit of Rs. 1,000 with a probability of 0.8 and a profit of Rs. 500 with a probability of 0.1 or else a loss of Rs. 400.

Select the best project with the reason for your choice.

III. A bag contains four red and five black counters. The counters are removed one at a time without replacement. If the counters are taken out at random find the probability that:

a. The first two counters removed are red
b. The second counter removed is red

Question No. 02

I. An unbiased die, marked 1 to 6, is rolled twice. Find the probability of :
   a. Rolling two fives
   b. The second throw being a five, given that the first throw is a five,
   c. Getting a score of nine from two throws
   d. Throwing at least one five
   e. Throwing exactly one five

II. Three people **A**, **B**, **C** tries their fortune for a price by rolling a tetrahedron with the faces numbered 1, 2, 3 and 4 (a four sided fair die). The winner is the first person to roll a four. If the tetrahedron is unbiased and they roll the die in the order **A**, then **B**, then **C**, find the probability that:
   a. **A** wins on the first throw
   b. **C** wins at his first attempt
   c. **B** wins at his second attempt
   d. **A** losses three successive throws including the first throw.

Question No. 03

I. After analyzing a lot of laptops it is observed that 15% of the laptops are not in working condition, from this lot 7 laptops were randomly selected. Find the probability that
   a. All defective
   b. Non defective
   c. At least one defective
   d. At most two defective
   e. Exactly three defective

II. The average number of road accidents per year in Colombo city is found to follow a Poisson distribution with mean 150. Find the probability that
   a. No accidents
   b. One accident
   c. Fewer than 150 accidents are reported in year

Question No. 04

I. A washing machine manufacturer states that the washing machines they produce have a mean lifetime of 6000 hours with a standard deviation of 300 hours. In general, it can be assumed that the lifetime of washing machines follows a Normal Distribution
   a. If a washing machine is selected at random, what is the probability that it has a lifetime less than 5000 hours?
   b. If a washing machine is selected at random, what is the probability that it has a lifetime more than 5500 hours?
   c. What percentage of the washing machines will last more than 6500 hours?
   d. If the manufacturer wishes to replace 5% of the washing machines free of charge, what should be the warranty period printed on the back of the washing machine?

II. A stock broker has computed the return on stockholder's equity for all companies listed on the Colombo Stock Exchange. He found that the data is normally distributed with mean 10% and standard deviation of 5%. Further he is interested in examining those companies whose return on stockholder's equity is between 16 and 22 percent. Given that approximately 1300 companies are listed on Colombo Stock Exchange, how many are of interest to him?

Question No. 05

I. Answer the following;
   a. Write down three different types of measures of central tendency and define each measure.
   b. The average rainfall of a town from Monday to Saturday is 0.4 inch. Due to heavy rainfall on Sunday to the town, the average rainfall for the week increased to 0.5 inch. What was the rainfall on Sunday?
   c. Show that for the set of values 1,2,3,4 and 5 the inequality

      Arithmetic Mean. >= Geometric Mean >= Harmonic Mean

      holds and

      Arithmetic Mean x Harmonic Mean = (Geometric Mean)^2

      holds

II. Find the Mean, Median, Mode and Standard Deviation of the following grouped frequency distribution.

Class Interval	Frequency (f)
10-15	4
15-20	10
20-25	14
25-30	20
30-35	12
35-40	9
40-45	6
45-50	5

III. Following statistics were obtained for two **Teams A** and **Team B** playing tennis in a given year. Find the more consistent team in that year out of the two teams A and B.

	Mean	Standard Deviation
Team A	15	5
Team B	20	4

Question No. 06

I. In order to determine the effect of price on sales of a product, 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:

Sites	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Price (Rs.)	20	20.50	21	21.50	22	22.50	23	23.50	24	24.50
Sales (000's)	14	13	15	8	11	9	7	8	5	4

a. Draw a scatter diagram after identifying the independent and dependent variables
b. Does it appear that a straight-line model is reasonable?
c. Find the correlation coefficient of the variables given and interpret it.
d. Derive the regression line to predict the sales in terms of price.

e. Interpret the regression model you developed in ***Part d***.

f. If the price is scheduled at Rs. 17.00, what would be the expected sales?

g. What is the validity of your forecast in ***Part f***.

Question No. 07

I. Following are the prices and quantities of three commodities **A, B** and **C** that a typical family has consumed in the years 2013 and 2014. Calculate the following price indices for the year 2014 by taking 2013 as the base year

a. Laspeyre's Index

b. Paasche's Index

c. Fisher's Index

	2013		**2014**	
Commodity	**Price**	**Quantity**	**Price**	**Quantity**
A	4	50	10	40
B	3	10	9	2
C	2	5	4	2

II. Write short notes on three of the following.

a. Type I error

b. Type II error

c. Significance level

d. Rejection region

III. A manufacturer claimed that at least 95% of the equipment that she supplied to a factory confirmed to specifications. An examination of a sample of 200 pieces of equipment revealed that 18 were faulty. Test her claim at the significance level of

a. 0.01

b. 0.05

Question No. 08

I. The following table gives the quarterly sales figures of a company over last three years.

Year	Quarter	Sales
2012	**Q1**	47
	Q2	46
	Q3	57
	Q4	44
2013	**Q1**	50
	Q2	53
	Q3	66
	Q4	51
2014	**Q1**	57
	Q2	56
	Q3	65
	Q4	51

a. Briefly explain the four components and basic models available in time series.
b. Using a scatter diagram or by observation suggest the best approach to find the trend of sales.
c. Using the approach you mentioned in **part b** find the forecasted trends for the year 2015.
d. Assuming a multiplicative model find the seasonal components.
e. Adjust the seasonal components you found in **part d**.
f. Interpret the seasonal components you found in **part e**.
g. Using the forecasted trends and the adjusted seasonal components find the forecasted sales for each quarter of the year 2015.

FORMULA SHEET

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

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

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

$$C.V. = \frac{SD}{Mean} \times 100 \qquad WAM = \frac{\sum wX}{\sum w}$$

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

$$r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}}$$

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

$$b = \frac{S_{xy}}{S_{xx}} \qquad R = 1 - \frac{6\sum d^2}{n(n^2 - 1)}$$

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

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

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

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

$$Z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}} \qquad T = \frac{\bar{x} - \mu_0}{s / \sqrt{n}}$$

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - d_0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \qquad T = \frac{(\bar{x}_1 - \bar{x}_2) - d_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$I_L = \frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times 100 \qquad I_P = \frac{\sum P_1 Q_1}{\sum P_0 Q_1} \times 100$$

$$I_F = \sqrt{I_L \times I_P}$$

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

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

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

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

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

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

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

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

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

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

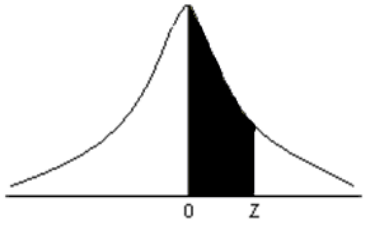
$$Median\ (Me) = L + \frac{\frac{N}{2} - f_c}{f} X\ I$$

$$Mode\ (Mo) = L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} X\ I$$

$$C_r^n = \frac{n!}{(n-r)!\,r!}$$

$$n! = n\,X(n-1)X(n-2) \ldots \ldots 3X2X1$$

The Standard Normal Distribution 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