EASTERN UNIVERSITY, SRI LANKA
FACULTY OF COMMERCE AND MANAGEMENT
SECOND YEAR SECOND SEMESTER EXAMINATION IN
BACHELOR OF BUSINESS ADMINISTRATION/ BACHELOR OF COMMERCE
2013/2014 (May 2016)
(PROPER/ REPEAT/ RE-REPEAT)
COM 2053 BUSINESS STATISTICS

Answer All Questions.   Time: 03 Hours
Calculators permitted.

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01. I)   Write the letter of the appropriate choice for each question:

i)   Customers at a local restaurant are requested to rate the services as excellent, good, fair, or poor. The level of measurement is
     a. Nominal   b.   Ordinal   c.   Interval   d.   Ratio

ii) In a frequency distribution the number of observations in each class is called
     a.   The class midpoint   b.   The class frequency
     c.   The class interval   d.   None of the above

iii) A useful measure to observe the lack of symmetry in a set of data is called the
     a.   Coefficient of skewness   b.   Coefficient of determination
     c.   Coefficient of variation   d.   Variance

iv) For a set of data the mean, median, and the mode are all 100. The standard deviation is 4. About 95 percent of the observations lie between
     a.   92 and 108   b.   96 and 104   c.   95 and 105   d.   Cannot be estimated

v)   A graph that shows the relationship between two interval or ratio variables is called a
     a.   Contingency table   b.   Scatter diagram
     c.   Stem-and-leaf display   d.   Dot plot

vi) Which of the following is not a condition of a binomial probability distribution?
     a.   Only two possible outcomes   b.   Constant probability of success
     c.   Must have at least three trials   d.   Independent trails

vii) Which of the following statements is not correct regarding the normal distribution?
     a.   It is defined by its mean and standard deviation   b.   The mean and median are equal
     c.   It is symmetric   d.   It is based on only two observations

viii) Using the standard normal probability distribution, what is the likelihood of finding z value greater than 1.66?
     a. 0.4515   b.   0. 9515   c.   0.5000   d.   0. 0485

ix) A sample of 15 observations from a normal population is selected to develop a 98 percent confidence interval for the mean. The appropriate value of t is
     a. 2.947   b.   2.977   c.   2.624   d.   none of the above

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x) Type II error is committed when
   a. Reject a true null hypothesis
   b. Accept a true alternate hypothesis
   c. Reject a true alternate hypothesis
   d. None of these is correct

xi) The test statistics for testing a hypothesis for sample means when the population standard deviation is unknown, is
   a. Z
   b. t
   c. F
   d. χ^2

xii) The strength of the association between a set of independent variables X and a dependent variable Y is measured by the
   a. Coefficient of correlation
   b. Coefficient of determination
   c. Coefficient of variation
   d. Standard error of estimate

xiii) A residual is defined as
   a. $Y - \hat{Y}$
   b. Error sum of square
   c. Regression sum of squares
   d. Type 1 error

xiv) The smoothed long-term direction of a time series is called the
   a. Cyclical variation
   b. Seasonal variation
   c. Trend
   d. Irregular variation

xv) The linear trend for the number of vehicles sold per year at Motor Sports, Inc. is given by the equation $\hat{Y} = 30 + 125t$. The base period, that is year 1, is 2001. Which of the following statements is correct?
   a. The estimated sales for 2008 is 1030
   b. Sales are increasing at a rate of 125 per year
   c. The estimated sales for 2000 would be 30
   d. All of the above are correct

(15 Marks)

II) **Write the appropriate terms/ number/ symbols for the given space**

i) The measure of central tendency most affected by extremely large values in a data is the ....

ii) If all the values in a data set are identical, the variance equals ....

iii) A measure computed from sample data is ....

iv) In a relative frequency distribution, the total of relative frequencies is equal to ....

v) Histogram is a graph of .... distribution

vi) The percent of total variation in the dependent variable Y explained by the independent variable is measured by ....

vii) The alternative hypothesis in testing the claim that the speed of a brand of fax machine is at least pages per minute is ....

viii) An investigator selected 100 male customers and found that 57 bought on credit while 52 of the 11 female customers did so. The observed value of the test statistic for testing the null hypothesis that the proportion of male customers who buy on credit equals the proportion of females who use credit is ....

ix) The rise and fall of a time series over periods longer than one year is called ....

x) Suppose 200 different samples are selected from a large population, and then each sample is used to construct a 95% confidence interval to estimate the population. How many of the 200 confidence interval estimates are expected to contain the population mean? ....

(10 Marks)
(Total 25 Marks)

02. Wildcat Plumbing Supply has served the plumbing needs of Western Region for more than 25 years. The company has grown from a handful of employees to more than 500 today. The company is concerned about several positions within the company where it has men and women doing essentially the same job but at different pay. Company collected the information below and wants to investigate the salary differences between men and women.

Monthly Salary (In Rs.000's)	Number of Women	Number of Men
20 - 30	2	0
30 - 40	3	1
40 - 50	17	4
50 - 60	16	24
60 - 70	9	21
70 - 80	3	7
80 - 90	0	3

a. Draw histograms for the salary of men and women and comment on the shape of the distributions of salary of men and women

b. Calculate the following measures for the salary of men and women separately:
   i)   Mean   ii)   Median   iii)   Mode   iv)   standard deviation

c. Based on the measures calculated in the above part, would you conclude that there are differences in salary between men and women?

(18 Marks)

03. I) a) A recent report in BusinessWeek indicated that 20 percent of all employees steal from their company each year. If a company employs 15 people,
   i)   What is the probability that at least 2 employees steal?
   ii) How many would you expect to steal from the company?

b) The mean amount purchased by a typical customer at Food City is Rs. 2350 with a standard deviation of Rs. 500. Assume that the distribution of amounts purchased follows the normal distribution.
   i)   What is the probability that the amount purchased by a typical customer is greater than Rs. 2250 but less than Rs. Rs. 2500?
   ii) For a sample of 50 customers, what is the probability that the mean amount purchased is below Rs. 2200?

(07 Marks)

II) a. A market survey was conducted to estimate the proportion of homemakers who would recognize the brand name of a cleanser based on the shape and the colour of the container. Of the 1400 homemakers sampled, 420 were able to identify the brand by name.
   i)   Estimate the value of the proportion of homemakers who are able to identify the brand name in the population
   ii) Construct a 99% confidence interval for the proportion of homemakers who are able to identify the brand name.
   iii) Interpret your findings

(05 Marks)

b. Commercial Bank and Trust Company is studying the use of its automatic teller machines (ATMs particular interest is whether young adults (under 25 years) use the machines more than se citizens. To investigate further, samples of customers under 25 years of age and customers ove years of age were selected. The number of ATM transactions last month was determined for e selected individual, and the results are shown below. (Assume that the populations have ec variances)

Under 25	10	10	11	15	7	11	10	9			
Over 60	4	8	7	7	4	5	1	7	4	10	5

i) Compute mean and standard deviation of the number of ATM transactions for both you adults and senior citizens.

ii) State the appropriate null and alternative hypotheses to test the interest of ba management.

iii) What is the critical value for the test at 1% level of significance?

iv) Formulate the decision criteria for the test.

v) What is the test statistic? Compute it for the given information.

vi) Write the statistical decision of the test.

vii) Write your conclusion about the interest of management.

viii) State any assumption(s) made in performing this test

(15 Marks

(Total 27 Marks

04. The management of Sri Lankan Airlines believes that there is a direct relationship between advertising expenditures and the number of passengers who choose to fly Sri Lankan Airlines. To check their belief statisticians were employed by Sri Lankan Airlines to use Ordinary Least Squares procedures to determine the regression model. The data is as follows:

Observation (Months)	Advertising (in $1,000's) (X)	Passengers (in 1,000's) (Y)
1	10	15
2	12	17
3	8	13
4	17	23
5	10	16
6	15	21
7	10	14
8	14	20
9	19	24
10	10	17
11	11	16
12	13	18
13	16	23
14	10	15
15	12	16

a. Draw an appropriate diagram for the above data set to identify whether there is any relationship between advertising expenditures and the number of passengers.

b. Comment on the relationship between advertising expenditures and the number of passengers based on the diagram obtained.

c. Compute an appropriate statistic to measure the strength of the relationship between advertising expenditures and the number of passengers. Interpret the statistic computed.

d. Calculate the coefficient of determination and interpret its value based on the given problem.

e. Estimate the least squares regression equation in an attempt to predict the number of passengers by the advertising expenditure and interpret its coefficients.

f. Sketch the regression line on the diagram obtained in part (a).

g. Predict the number of passengers for an expenditure of $9,000.

(18 Marks)

(Total Marks 18)

Deleven International manufactures and sells toys all around the world. Management accountant of the company wishes to determine seasonal indexes for the quarterly data on revenue. The following table shows the quarterly sales for Deleven International for the years 2013 through 2014. The sales are reported in millions of rupees.

Year	Quarter	Sales
2013	1	7.0
	2	5.5
	3	10.8
	4	15.0
2014	1	7.1
	2	5.7
	3	11.1
	4	14.5
2015	1	8.0
	2	6.2
	3	11.4
	4	14.9

a. Determine a quarterly seasonal index using the ratio-to-moving-average method.

b. The estimated sales trend line is given by $\hat{Y}_t = 7.4885 + 0.3510t$, where $t = 1$ denotes the first quarter of 2013.

i) Forecast the sales for the first three quarters of 2016 incorporating the seasonal index.

ii) If the cyclical index is 0.95, what would be the forecasted sales for the fourth quarter of 2016?
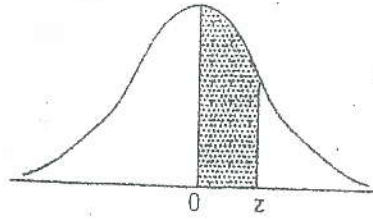
(12 Marks)

(Total Marks 12)

TABLE

Area Under Normal Curve

$$z = \frac{x - \bar{x}}{\sigma}$$

z	0	1	2	3	4	5	6	7	8
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190
0.6	0.2258	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823
0.8	0.2881	0.2910	0.2939	0.2967	0.2996	0.3023	0.3051	0.3078	0.3106
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990

Critical Values of t
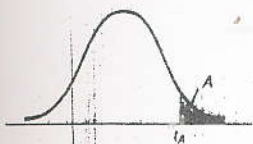
DEGREES OF FREEDOM	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$	DEGREES OF FREEDOM	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$
1	3.078	6.314	12.706	31.821	63.657	24	1.318	1.711	2.064	2.492	2.797
2	1.886	2.920	4.303	6.965	9.925	25	1.316	1.708	2.060	2.485	2.787
3	1.638	2.353	3.182	4.541	5.841	26	1.315	1.706	2.056	2.479	2.779
4	1.533	2.132	2.776	3.747	4.604	27	1.314	1.703	2.052	2.473	2.771
5	1.476	2.015	2.571	3.365	4.032	28	1.313	1.701	2.048	2.467	2.763
6	1.440	1.943	2.447	3.143	3.707	29	1.311	1.699	2.045	2.462	2.756
7	1.415	1.895	2.365	2.998	3.499	30	1.310	1.697	2.042	2.457	2.750
8	1.397	1.860	2.306	2.896	3.355	35	1.306	1.690	2.030	2.438	2.724
9	1.383	1.833	2.262	2.821	3.250	40	1.303	1.684	2.021	2.423	2.705
10	1.372	1.812	2.228	2.764	3.169	45	1.301	1.679	2.014	2.412	2.690
11	1.363	1.796	2.201	2.718	3.106	50	1.299	1.676	2.009	2.403	2.678
12	1.356	1.782	2.179	2.681	3.055	60	1.296	1.671	2.000	2.390	2.660
13	1.350	1.771	2.160	2.650	3.012	70	1.294	1.667	1.994	2.381	2.648
14	1.345	1.761	2.145	2.624	2.977	80	1.292	1.664	1.990	2.374	2.639
15	1.341	1.753	2.131	2.602	2.947	90	1.291	1.662	1.987	2.369	2.632
16	1.337	1.746	2.120	2.583	2.921	100	1.290	1.660	1.984	2.364	2.626
17	1.333	1.740	2.110	2.567	2.898	120	1.289	1.658	1.980	2.358	2.617
18	1.330	1.734	2.101	2.552	2.878	140	1.288	1.656	1.977	2.353	2.611
19	1.328	1.729	2.093	2.539	2.861	160	1.287	1.654	1.975	2.350	2.607
20	1.325	1.725	2.086	2.528	2.845	180	1.286	1.653	1.973	2.347	2.603
21	1.323	1.721	2.080	2.518	2.831	200	1.286	1.653	1.972	2.345	2.601
22	1.321	1.717	2.074	2.508	2.819	∞	1.282	1.645	1.960	2.326	2.576
23	1.319	1.714	2.069	2.500	2.807						

SOURCE: From M. Merrington, "Table of Percentage Points of the t-Distribution," *Biometrika* 32 (1941): 300. Reproduced by permission of the Biometrika Trustees.