EASTERN UNIVERSITY, SRI LANKA
FACULTY OF COMMERCE AND MANAGEMENT

THIRD YEAR – FIRST SEMESTER EXAMINATION IN BUSINESS ADMINISTRATION/ COMMERCE

2008 / 2009 (SEPT. 2009) (REPEAT)

DAF 3134 BUSINESS STATISTICS

Answer all Questions   Time: 03 hours

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1. (i) Discriminate between a pair of terms "Random variable and probability distribution".

(ii) In September, demand for industrial furnace boilers at a large plumbing supply warehouse has a mean of 7 boilers with a standard deviation of 2 boilers. The warehouse pays a unit cost of Rs. 2225 per boiler plus a fee of Rs. 500 per month to act as dealer for these boilers. Boilers are sold for Rs. 2850 each. Find the mean and standard deviation of September profit.

(iii) In the following probability distribution, the random variable X represents the number of bad switches found by an inspector

X	0	1	2	3	4
P(X=X)	0.35	0.38	0.2	0.05	0.02

(a) What is the shape of the distribution?

(b) What is the mean of the random variable X?

(c) What is the standard deviation of the random variable X?

(d) What is the probability that the inspector finds 3 or 4 bad switches?

(iv) (a) The number of defective parts produced per day by an automated machine follows a Poisson probability distribution with a mean of 4. What is the probability that on 2 consecutive days at least 2 defective parts are produced?

(b) A student majoring in accounting has been told by a placement counselor that she can expect to receive a job offe. from 80% of the firms to which she applies. The student applies to only five firms. What is the probability that the student receives exact five offers? What is the expected number of offers she receives?

(20 Marks)

2. (i) Distinguish between a normal distribution and a standard normal distribution.

(ii) Describe the effect of changing the va.ue of variance of a normal distribution with same mean.

(iii) An automatic machine in a manufacturing process is operating properly if the lengths of an important subcomponent are normally distributed with mean 117 cm and standard deviation 5.2 cm.

a) Find the probability that one selected subcomponent is longer than 120cm.

(b) Find the probability that if four subcomponents are randomly selected, their mean length exceeds 120 cm.

(c) Find the probability that if four subcomponents are randomly selected, all four have lengths that exceed 120cm.

(iv) It has been found that 7 percent of the tools manufactured by a factory are defective. What is the probability that in a shipment of 625 such tools 8 percent or more will be defective?

(20 Marks)

3. (i) Define the terms given below.

(a) Parameter (b) Statistics

(c) Level of significance (d) Level of confidence

(ii) In a time study in the banking industry, 30 randomly selected managers spent a mean of 2.4 hours each day on paper work with a standard deviation of 1.3 hours.

(a) Construct a 95% confidence interval for the mean paperwork time of all the managers.

(b) Interpret the confidence interval in the context of the question.

(c) For the result at part (a) to be valid, must the population distribution of hours spent by bank managers on paper work be normal? Explain why or why not.

(d) What sample size would be required to estimate the mean number of hours spent each day on paper work by bank managers to within ½ hours with 99% confidence.

(iii) A company is considering two different television advertisements for promotion of a new product. Management believes that advertisement A is more effective than advertisement B. Two test market areas with virtu ̈y identical consumers' characteristics are selected. Advertisement A is used in one area and advertisement B is in the other area. In a random sample of 60 customers who saw advertisement A, 18 tired the product. In a random sample of 100 customers who saw advertisement B, 22 tried this product. Test the believe of management at 5% level of significance.

(a) State the null and alternative hypothesis.

(b) What is the critical value?

(c) What is the test statistic? What is the value of the test statistic?

(d) Sketch the rejection region and mark in the critical value

(e) Will you accept or reject the null hypothesis?

(f) Interpret your result in the context of the question.

(20 Marks)

4. (i) (a) Distinguish between correlation and regression.

(b) What are the assumptions involved in the regression analysis?

(c) Describe the role of regression analysis in business and industry.

(ii) The following data relate to training and performance of salesmen employed in a company.

Salesman	1	2	3	4	5
Hours of training	20	05	10	13	12
Performance(Average weekly sales in '000Rs)	44	22	25	32	27

(a) Fit the least squares linear regression line to the above data.

(b) Interpret the slope of the regression line in the context of the data.

(c) Estimate the weekly sales that are likely to be attained by a salesman who is given 16 hours of training.

(d) Compute the value of R^2, the coefficient of determination.

(e) Interpret R^2 in the context of the data.

(f) Compute the value of r, the correlation coefficient.

(g) Interpret r in the context of the data.

(20 Marks)

5. (i) Which of the four components of a time series you would use in the following cases and why?

(a) The effect of new year sales of textiles on a large retail outlet of readymade garments

(b) The effect of war

(c) Increasing house construction activity during the past five years

(d) Recession.

(ii) The revenues (in Rs. millions) of a chain of Ice cream stores are listed for each quarter during the pervious 5 years.

Year

Quarter	2004	2005	2006	2007	2008
1	68	65	68	70	60
2	62	58	63	59	55
3	61	56	63	56	31
4	63	61	67	62	58

(a) Calculate the four – quarter centered moving averages.

(b) Using the moving averages computed in part (a) calculate the seasonal indexes.

(c) Interpret the seasonal indexes.

(iii) The following trend line and seasonal indexes were computed from 10 years of quarterly observations. Forecast the next year's time series.

$$\hat{Y} = 150 + 3t \quad t = 1,2,\text{------------}40$$

Quarter	1	2	3	4
Seasonal Index	0.7	1.2	1.5	0.6

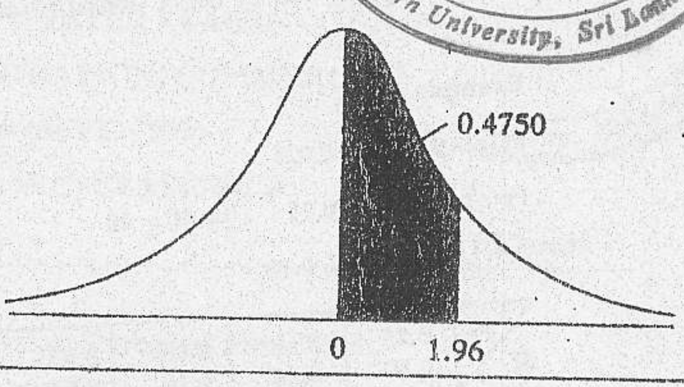
(20 Marks)

Areas under the standardized normal distribution

Example

$\Pr(0 \leq Z \leq 1.96) = 0.4750$

$\Pr(Z \geq 1.96) = 0.5 - 0.4750 = 0.025$



Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4454	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Note: This table gives the area in the right-hand tail of the distribution (i.e., $Z \geq 0$). But since the normal distribution is symmetrical about $Z = 0$, the area in the left-hand tail is the same as the area in the corresponding right-hand tail. For example. $P(-1.96 \leq Z \leq 0) = 0.4750$. Therefore, $P(-1.96 \leq Z \leq 1.96) = 2(0.4750) = 0.95$.

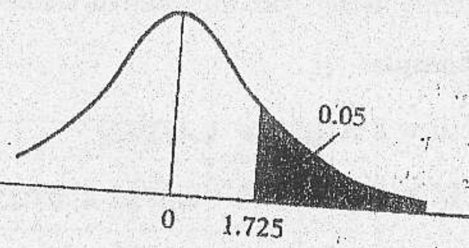
Percentage points of the t distribution

Example

$Pr(t > 2.086) = 0.025$

$Pr(t > 1.725) = 0.05$ for df = 20

$Pr(|t| > 1.725) = 0.10$



df \ Pr	0.25 0.50	0.10 0.20	0.05 0.10	0.025 0.05	0.01 0.02	0.005 0.010	0.001 0.002
1	1.000	3.078	6.314	12.706	31.821	63.657	318.31
2	0.816	1.886	2.920	4.303	6.965	9.925	22.327
3	0.765	1.638	2.353	3.182	4.541	5.841	10.214
4	0.741	1.533	2.132	2.776	3.747	4.604	7.173
5	0.727	1.476	2.015	2.571	3.365	4.032	5.893
6	0.718	1.440	1.943	2.447	3.143	3.707	5.208
7	0.711	1.415	1.895	2.365	2.998	3.499	4.785
8	0.706	1.397	1.860	2.306	2.896	3.355	4.501
9	0.703	1.383	1.833	2.262	2.821	3.250	4.297
10	0.700	1.372	1.812	2.228	2.764	3.169	4.144
11	0.697	1.363	1.796	2.201	2.718	3.106	4.025
12	0.695	1.356	1.782	2.179	2.681	3.055	3.930
13	0.694	1.350	1.771	2.160	2.650	3.012	3.852
14	0.692	1.345	1.761	2.145	2.624	2.977	3.787
15	0.691	1.341	1.753	2.131	2.602	2.947	3.733
16	0.690	1.337	1.746	2.120	2.583	2.921	3.686
17	0.689	1.333	1.740	2.110	2.567	2.898	3.646
18	0.688	1.330	1.734	2.101	2.552	2.878	3.610
19	0.688	1.328	1.729	2.093	2.539	2.861	3.579
20	0.687	1.325	1.725	2.086	2.528	2.845	3.552
21	0.686	1.323	1.721	2.080	2.518	2.831	3.527
22	0.686	1.321	1.717	2.074	2.508	2.819	3.505
23	0.685	1.319	1.714	2.069	2.500	2.807	3.485
24	0.685	1.318	1.711	2.064	2.492	2.797	3.467
25	0.684	1.316	1.708	2.060	2.485	2.787	3.450
26	0.684	1.315	1.706	2.056	2.479	2.779	3.435
27	0.684	1.314	1.703	2.052	2.473	2.771	3.421
28	0.683	1.313	1.701	2.048	2.467	2.763	3.408
29	0.683	1.311	1.699	2.045	2.462	2.756	3.396
30	0.683	1.310	1.697	2.042	2.457	2.750	3.385
40	0.681	1.303	1.684	2.021	2.423	2.704	3.307
60	0.679	1.296	1.671	2.000	2.390	2.660	3.232
120	0.677	1.289	1.658	1.980	2.358	2.617	3.160
∞	0.674	1.282	1.645	1.960	2.326	2.576	3.090

Note: The smaller probability shown at the head of each column is the area in one tail; the larger probability is the area in both tails.

Source: From E. S. Pearson and H. O. Hartley, eds., *Biometrika Tables for Statisticians,* vol. 1, 3d ed., table 12, Cambridge University Press, New York, 1966. Reproduced by permission of the editors and trustees of *Biometrika.*