EASTERN UNIVERSITY SRI LANKA
FACULTY OF COMMERCE AND MANAGEMENT
SECOND YEAR SECOND SEMESTER EXAMINATION IN
BUSINESS ADMINISTRATION/ COMMERCE 2009/2010
(SEPT 2010)
COM 2053 BUSINESS STATISTICS

Answer All Questions **Time: 03 Hours**

01 (I) (a) "Measures of central tendency, dispersion and skewness are complementary to each other in understanding the characteristics of a frequency distribution". Explain it clearly.

(b) Following table given the distribution of age of lady teachers of a school as revealed by records.

Age group (Years)	15-19	20-24	25-29	30-34	35-39	40-44	45-49
No. of lady Teachers	03	13	21	15	05	04	02

(i) Graphically illustrate the distribution of age of lady teachers. With an appropriate diagram

(ii) Compute a. Quartile deviation

b. Coefficient of variation and interpret it.

(II) The following data represent the total fat for burgers and chicken items from a sample of fast food chains:

Burgers :	19	31	34	35	39	39	40				
Chicken:	07	09	15	16	16	18	22	25	27	33	39

For the burgers and chicken items separately, set up a stem- and- leaf display. Compare the burgers and chicken items in terms of total fat.

(III) Suppose that an analysis of incomes in a large company reveals the following:

Q_1 = Rs. 23000; Q_2 = Rs. 31000; Q_3 = Rs. 46000

(a) What do these statistics reveal about the distribution of incomes?

(b) Calculate the interquartile range.

(c) Interpret the value of the interquartile range.

(d) Suppose that your income is Rs. 48000. What can you say about your inco relative to the incomes of others in the company?

(20 Mar

02 (I) Define the terms given below clearly:

(a) Random variable; (b) Probability distribution;

(c) Sampling distribution.

(II) After watching a number of children playing games at a video arcade, a statisti practitioner estimated the following probability distribution of X, the number of gam per visit.

X	1	2	3	4	5	6	7
P(x)	0.05	0.15	0.15	0.25	0.20	0.10	0.10

(a) What is the probability that a child play at most 3 games?

(b) Compute the mean and variance of the number of games played.

(c) Suppose that each game costs the player 25 cents. Construct the probabili distribution of the amount of money the arcade takes per child.

(III) Suppose that the random variables X_A and X_B which denote the respective cash flows the two firms A and B, are statistically independent. The firms A and B each faced wi the same probability distribution of annual cash flows are as shown below.

X_A	100	250	500
Probability	0.1	0.2	0.7

X_B	100	250	500
Probability	0.1	0.2	0.7

(a) Construct the bivariate probability distribution of the cash flows of the two firms.

(b) If the two firms are merged, find the probability distribution of $X_A + X_B$, the combined cash flows of the firms.

(c) Find the probability that the combined cash flow of the firms is less than 480.

(20 Marks)

03 (I) (a) When the Poisson approximation to the binomial is used?

(b) On average 2% of all persons who are given a breathalyzer test by the state police pass the test. Suppose that 500 breathalyzer tests are given. What is the approximated probability that at least 6 will pass the exam? Justify your answer.

(II) (a) Two firms A and B manufacture similar components with a mean breaking strength of 3000 and 2500 and standard deviation of 200 and 100 respectively. If a random samples of100 components of firm A and 50 components of firm B are tested, what is the probability that the components from firm a will have a mean breaking strength which is at least 450 more than the components of firm B?

(b) A normal population of 700 wage earners has a mean income of Rs 200 per month and the variance is 332. Find the number of persons who earn between Rs 150 and Rs 200.

(c) A factory turns out an article by mass production methods. From the past experience it appears that 20 articles, on average are rejected out of every batch of 100. Find the variance of number of rejects in a batch.

(III) Digital Technology Incorporated uses statistical quality control to monitor the production process during the manufacture of memory chips. Historically, digital manufacturing process has produced 5.5% defective chips. Digital takes random samples of n chips from the production line at regular intervals and if the fraction of chips that are defective in a sample is found to be not more than 0.0866, the production process is considered to be "in- control". Otherwise the production process will be halted for further investigation.

(a) Find the probability that a random sample of 200 chips will result in the proc being declared "in- control" if it is presently producing defective chips at the of 5.5%.

(b) Determine the minimum sample size n such that the probability is at least 9 that such a random sample of n chips will result in the process being declared control" if it is presently producing defective chips at the rate of 5.5%

(20 Mar

04 (I) A department store gives inservice training to its salesmen followed by a test consider whether it should terminate the services of any of the salesmen who does qualify the test. The following data give the test scores and sales made by nine salesr during a certain period.

Test score	14	19	24	21	28	22	15	20	19
Sales (1000 Rs)	31	36	48	37	50	45	33	41	39

(a) Calculate the coefficient of correlation between the scores and the sales.

(b) Does it indicate that the termination of services of the low test score is justifi Explain.

(c) Find the least squares of sales on test score.

(d) If the firm wants a minimum sales volume of Rs 3000, what is the test score will ensure continuation of the services?

(II) (a) What is a time series? Distinguish between the secular trends the seas variations and the cyclical fluctuations?

(b) The following data give by quarter the total number (in Thousands) of crimes and offenses recorded by the police in England and Wales.

Quarter	1	2	3	4
1982	186.5	191.8	190.1	197.7
1983	190.0	198.0	203.8	207.6
1984	188.9	207.0	202.9	212.6
1985	196.4	207.8	203.1	206.4
1986	196.4	206.1		

Calculate quarterly indices for the data using a four- quarter centered moving average.

(20 Marks)

05 (I) Distinguish between the pair of terms given below

(a) Level of significance and level of confidence;

(b) Type I error and Type II error;

(c) Confidence interval estimate and point estimate;

(d) Parameter and statistic.

(II) (a) A courier services advertises that its average delivery time is less than 6 hours for local deliveries. A random sample times for 12 deliveries to an address across town was recorded. These data are shown here. Is there sufficient evidence to support the courier's advertisement at the 5% level of significance?

3.03	6.33	6.50	5.22	3.56	6.76
7.98	4.82	7.96	4.54	5.09	6.46

(b) Surveys have been widely used by politicians around the world as a way of monitoring the opinions of the electorate. Six months ago a survey was undertaken to determine the degree of support for a national party leader. Of a sample 1100, 56% indicated that they would vote for this politician. This month another survey of 800 voters revealed that 46% now support the leader.

(i) At the 5% significance level, can we infer that the national leader's popularity has decreased?

(ii) At the 5% significance level, can we infer that the national leader's popularity has decreased by more than 5%?

(iii) Estimate the 95% confidence interval for the decrease in percentage support between now and 6 months ago.

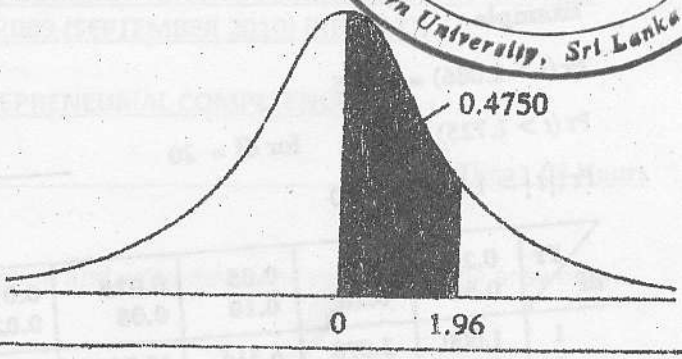
(20 Marks)

eas under the standardized normal distribution

ample

$0 \le Z \le 1.96) = 0.4750$

$Z \ge 1.96) = 0.5 - 0.4750 = 0.025$



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

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

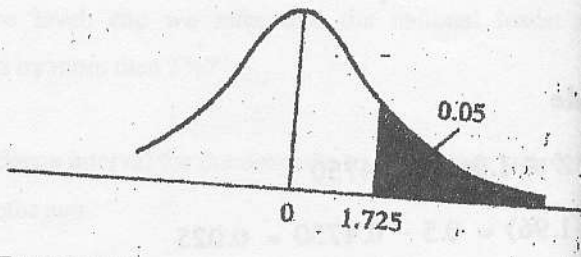
Percentage points of the t distribution

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*.