THE OPEN UNIVERSITY OF SRI LANKA

DIPLOMA IN INDUSTRIAL STUDIES

FINAL EXAMINATION – 2012/2013

TTZ4241 – STATISTICS FOR INDUSTRIAL STUDIES

DURATION – THREE HOURS

DATE: 18th August 2013 **TIME: 0930-1230 HOURS**

Answer Question 01, which is compulsory and additional five (05) questions.

Question 1 carries twenty-five marks and Questions 2 to 8 carry fifteen (15) marks each.

You should clearly show the steps involved in solving problems.

No marks are awarded for the mere answers without writing the necessary steps

COMPULSORY QUESTION

01. (A) Briefly describe the following terms used in statistics.

i. Descriptive Statistics

ii. Probability of an event

iii. Discrete and Continuous variables

iv. Measures of location of a given set of data **(08 Marks)**

(B) A sample of the personal files of 08 female employees in Rolex Manufacturing Company revealed that during a six month period they were absent for the following number of days.

02 00 06 03 10 04 01 02

i. Calculate the mean and median of the above data.

ii. Calculate the standard deviation of the above data. **(06 Marks)**

(C) There are 100 garments in a pack and 14 of them are defective. Three garments are to be selected, one after the other, without replacement

What is the probability that

i. all three will be defective **(03 marks)**

ii. if the first one is defective and the other two are non-defective **(03 marks)**

(D) Determine the area under the Standard Normal curve for the following situations.

i. Area to the left of Z = 1.25

ii. Area to the right of Z = 1.75

iii. Area between Z = – 1.25 and 1.54 **(02 Marks)**

(E) Briefly explain what you understand by "null hypothesis" and "alternate hypothesis". **(03 Marks)**

Answer any Five questions from the below given Seven questions

(02) (a) Describe the importance of the measures of dispersion in a given set of data **(03 Marks)**

(b) Each person who applies for mechanical job at the work shop in the University is given a mechanical aptitude test. One part of the test involves assembling a small part of a machine. The length of time it took 42 persons to assemble the part was organized into the following frequency table

Time (in minutes)	No. of persons
1 - 3	04
4 - 6	08
7 – 9	14
10 – 12	09
13 - 15	05
16 - 18	02

i. Calculate the mean, and the median of the data. **(06 Marks)**

ii. Calculate the standard deviation and the coefficient of variation **(06 Marks)**

(03) (a) Write the mathematical formula of the binomial probability distribution. **(03 Marks)**

(b) In Adams Private Ltd., absence percentage of the work force is 08%. Ten employees are to be selected at random for a study of absenteeism.

i. What is the random variable in this problem?

ii. Is the random variable discrete or continuous?

iii. What is the probability of selecting ten employees at random and finding that none of them are absent?

iv. Develop binomial probability distribution for this experiment. **(12 Marks)**

(04) (a) Write the mathematical formula of the 'Poisson probability distribution'. **(03 Marks)**

(b) The sale of automobiles at Kandurata Automobiles in the Kandy area follows a Poisson distribution with mean of 3.00 per day.

i. What is the probability that no automobile is sold on a particular day?

ii. What is the probability that one automobile is sold on a particular day?

iii. What is the probability that for five consecutive days at least one automobile is sold? **(12 Marks)**

(05) (a) What do you understand by the terms 'point estimation' and 'interval estimation'? **(03 Marks)**

(b) The contents of bottles of oil are known to be normally distributed. A random sample of 15 bottles shows that the mean of the sample is 200ml and the standard deviation is 20ml. Develop 99%, 95% and 92% confidence limits for mean daily output. **(12 Marks)**

(06) (a) Explain what do you understand by "Sampling distribution of means" **(03 Marks)**

(b) A population consists of following four values: 12, 12, 14, 16

i. How many samples of 2 are possible? **(02 Marks)**

ii. List all possible samples of size 2, and compute the mean of each sample. **(03 Marks)**

iii. Compute the mean of the sample means and the population mean **(03 Marks)**

(c) State the "Central Limit Theorem" and describe its importance in statistics. **(04 Marks)**

(07) (a) Describe what you understand by "Hypothesis Testing"? **(03 Marks)**

(b) The manufacturer of the X tires claims that the mean mileage the tire can be driven before the tread wears out is 60,000 miles. The standard deviation is 5000 miles. The Roadmasters Ltd. bought 48 tires and found that mean mileage for the tires they used for their trucks is 59,500 miles. Roadmasters Ltd. wants to check whether their experience is different from the claim by the manufacturer at the 0.05 significant level.

i. State the "Null Hypothesis" and "Alternate Hypothesis" **(02 Marks)**

ii. What is the decision rule? **(03 Marks)**

iii. Compute the test statistics. **(03 Marks)**

iv. Can Roadmasters Ltd. conclude that their experience is different to that of the manufacturer at 0.05 significant level? **(04 Marks)**

(08) (a) Write three properties of the normal probability distribution. **(02 Marks)**

(b) The mean score of a University entrance test is 500 with standard deviation of 75. The scores are normally distributed.

i. What percentage of the students scored above 500? **(04 Marks)**

ii. What percentage of the students scored 320 or below? **(04 Marks)**

iii. Top ten percentage of the students who scored well in the test are to be selected for an award of scholarships. Find the minimum mark that a student should score to get a scholarship. **(05 Marks)**

Poisson Distribution: Probability of Exactly X Occurrences

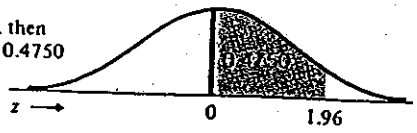
	μ								
X	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	0.9048	0.8187	0.7408	0.6703	0.6065	0.5488	0.4966	0.4493	0.4066
1	0.0905	0.1637	0.2222	0.2681	0.3033	0.3293	0.3476	0.3595	0.3659
2	0.0045	0.0164	0.0333	0.0536	0.0758	0.0988	0.1217	0.1438	0.1647
3	0.0002	0.0011	0.0033	0.0072	0.0126	0.0198	0.0284	0.0383	0.0494
4	0.0000	0.0001	0.0003	0.0007	0.0016	0.0030	0.0050	0.0077	0.0111
5	0.0000	0.0000	0.0000	0.0001	0.0002	0.0004	0.0007	0.0012	0.0020
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

	μ								
X	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
0	0.3679	0.1353	0.0498	0.0183	0.0067	0.0025	0.0009	0.0003	0.0001
1	0.3679	0.2707	0.1494	0.0733	0.0337	0.0149	0.0064	0.0027	0.0011
2	0.1839	0.2707	0.2240	0.1465	0.0842	0.0446	0.0223	0.0107	0.0050
3	0.0613	0.1804	0.2240	0.1954	0.1404	0.0892	0.0521	0.0286	0.0150
4	0.0153	0.0902	0.1680	0.1954	0.1755	0.1339	0.0912	0.0573	0.0337
5	0.0031	0.0361	0.1008	0.1563	0.1755	0.1606	0.1277	0.0916	0.0607
6	0.0005	0.0120	0.0504	0.1042	0.1462	0.1606	0.1490	0.1221	0.0911
7	0.0001	0.0034	0.0216	0.0595	0.1044	0.1377	0.1490	0.1396	0.1171
8	0.0000	0.0009	0.0081	0.0298	0.0653	0.1033	0.1304	0.1396	0.1318
9	0.0000	0.0002	0.0027	0.0132	0.0363	0.0688	0.1014	0.1241	0.1318
10	0.0000	0.0000	0.0008	0.0053	0.0181	0.0413	0.0710	0.0993	0.1186
11	0.0000	0.0000	0.0002	0.0019	0.0082	0.0225	0.0452	0.0722	0.0970
12	0.0000	0.0000	0.0001	0.0006	0.0034	0.0113	0.0263	0.0481	0.0728
13	0.0000	0.0000	0.0000	0.0002	0.0013	0.0052	0.0142	0.0296	0.0504
14	0.0000	0.0000	0.0000	0.0001	0.0005	0.0022	0.0071	0.0169	0.0324
15	0.0000	0.0000	0.0000	0.0000	0.0002	0.0009	0.0033	0.0090	0.0194
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0014	0.0045	0.0109
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0006	0.0021	0.0058
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0009	0.0029
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0004	0.0014
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0006
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

Areas under the Normal Curve

00126

Example:
If $z = 1.96$, then
$P(0 \text{ to } z) = 0.4750$



z	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	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990