THE OPEN UNIVERSITY OF SRI LANKA

BACHELOR OF SOFTWARE ENGINEERING

TTZ4161 – PROBABILITY AND STATISTICS

FINAL EXAMINATION – 2011/2012

DURATION – THREE HOURS

DATE: 04th March 2012 **TIME: 0930- 1230 HOURS**

Answer Question 01, which is compulsory and additional five (05) questions.
Question 1 carries twenty-five marks(25) 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

01. Compulsory Question

(A) Briefly describe the following terms used in statistics.
(i) Sample and Population
(ii)'Discrete' and 'Continuous' variables
(iii) Probability Distribution of a given set of data

(06 Marks)

(B) Following are the marks obtained by students in a test
64,70, 82,.56,52,58,64,72,76, 80,

(i) Calculate the mean and median of the marks.

(ii) Calculate the standard deviation of the above marks.

(06 Marks)

(C) There are 100 CDs in a pack.and, 12 of which are defective. Three CDs to be selected, one after the other.
What is the probability that
(i) all three will be defective
(ii)if the first one is defective and the other two are non-defective.

(06 Marks)

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

- Area to the left of Z=1.23
- Area to the right of Z= 1.42
- Area between Z= – 1.23 and 1.31 **(03 Marks)**

(E) Briefly explain what you understand by "null hypothesis" and "alternate hypothesis". **(04 Marks)**

Answer any Five(05) questions from the below (07)Seven questions

(02) (a) Describe the importance of the measures of dispersion **(03 Marks)**

(b) The management of the ABC Bank is studying the number of times the Automatic teller, located in Nugegoda is used per day.Following are the number of times the machine was used over each of the last 30 days.

83	64	84	76	84	54
75	59	70	61	63	80
84	73	68	52	65	90
52	77	95	36	78	61
59	84	95	47	87	60

(i) Arrange them in a frequency table. **(04 Marks)**

(ii) Calculate mean, and median of the data. **(04 Marks)**

(iii) Calculate the variance, standard deviation and coefficient of variation **(04 Marks)**

(03) (a) Write the general rule of multiplication and the general rule of addition in probability. **(02 Marks)**

(b) Two factories A and B manufacture the same machine part. Each part is classified as having 0, 1, 2 or 3 manufacturing defects. The probabilities are as follows:

	Number of defects			
	0	1	2	3
Factory A	0.1250	0.0625	0.1875	0.1250
Factory B	0.0625	0.0625	0.1250	0.2500

(i) A part is observed to have no defects. What is the probability that it was produced by factory A? **(03 Marks)**

(ii) A part is known to have been produced by factory A. What is the probability that the part has no defects? **(03 Marks)**

(iii) A part is known to have two or more defects. What is the probability that it was manufactured by factory A? **(03 Marks)**

(iv) A part is known to have one or more defects. What is the probability that it was manufactured by factory B?

(04 Marks)

(04) (a) Write the mathematical formula of the "Binomial probability distribution".

(03 Marks)

(b) In a recent survey it was revealed that 90 percent of the houses in Colombo City have colour TVs .Sample of 10 are to be selected at random for a study.

(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 is absent?

(iv) Develop binomial probability distribution for this experiment.

(12 Marks)

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

(b) The sales of AB Cars in Kandy Branch follow a Poisson Distribution with a mean 2.00 per day.

(i) What is the probability that no car is sold on a particular day?

(ii) What is the probability that at least one car is sold in a day?

(iii) What is the probability that at least one car is sold for five consecutive days?

(12 Marks)

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

(b) What do you understand by the terms 'point estimation' and 'interval estimation'? **(02 Marks)**

(c) A Professor of English, counted the number of misspelled words on a report he recently assigned for his class of 50 students. The mean number of misspelled words was 7.00 and the standard deviation 2.30. Calculate

(i) 99%,

(ii) 95%, and

(iii) 92% confidence limits for mean number of misspelled words in the population of students.

(You should describe how would you obtained the answer)

(09 Marks)

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

(b) The manufacturer of the A-15 Tyre claims that the mean mileage the tyre can be driven before the thread wear out is 60,000 km.The standard deviation of the mileage is 5000 km.The XY Company bought 48 tyres and found that the mean mileage for their truck is 59,500 km.Is the XY Company experience different from that claim by the manufacturers at the .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 the company conclude that the manufactures claim is reasonable at the 0.05 significant level? **(04 Marks)**

(08) (a) What are the two parameters which characterize the normal probability distribution. **(03 Marks)**

(b) The life time of a particular type of bulb is normally distributed with the mean of 2000 Hrs and standard deviation 200 Hrs.

Find the probability that one of these bulbs will last

(i) between 2000 and 2400 Hrs **(04 Marks)**

(ii) between 1600 and 2500 Hrs **(04 Marks)**

(iii) After how many number of burning hours would you expect that 5% of the bulbs would fail ? **(04 Marks)**

Appendix – 2

Normal Distribution Table

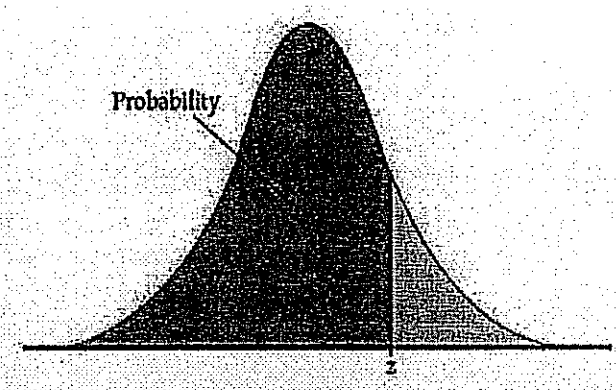

Table entry for z is the area under the standard normal curve to the left of z.

Standard normal probabilities

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7703	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

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