THE OPEN UNIVERSITY OF SRI LANKA

BACHELOR OF SOFTWARE ENGINEERING

TTZ4161 – PROBABILITY AND STATISTICS

FINAL EXAMINATION – 2013/2014

DURATION – THREE HOURS

| DATE: 05th September 2014 | TIME: 0930- 1230HOURS |

Answer Question 01, which is <u>compulsory</u> 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

(01). Compulsory Question

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

(i)   Descriptive Statistics

(ii)   Population and Sample

(iii)   One tailed test and Two tailed test   (06 Marks)

(B)   ABC Bank selected 10 of their current account holders for a study.   Following are the ages (in years) of these account holders.

54   48   58   50   25   47   75   46   60   70

(i) Calculate the mean and the median of the ages.   (02 Marks)

(ii) Calculate the standard deviation of the ages.
(Show your calculation method clearly)   (04 Marks)

(C) A sales representative of a software company makes calls to their separate unrelated customers. The chance of making a sale to any one of them is 40%. What is the probability that a sale is made on the third call only?   (04 Marks)

(D) In a group of 200 students, 60 are males and 100 students are studying at foundation level. Thus, 10 of male students are not doing foundation level. A student chosen at random is a female, what is the probability that she is not studying at foundation level? (04 Marks)

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

- Area to the right of Z=1.43
- Area between Z= – 1.20 and 1.45 (02 Marks)

(F) Briefly explain what do you understand by the terms "**Null hypothesis**" and "**Alternate hypothesis**". (03 Marks)

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

(02) (a) In a given set of data, two measures are important.

(i) measures of central tendency.

(ii) measures of dispersion

Explain the importance of each of them (04 Marks)

(b) Following are the ages (in years) of 20 children in a children welfare center.

08	06	03	11	14
08	09	16	09	10
05	11	07	08	08
10	09	12	13	09

(i) Arrange them in a frequency table. (03 Marks)

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

(iii) Calculate the , standard deviation and coefficient of variation of the set of data.. (04 Marks)

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

(b) A bag contains 40 marbles. 06 of them are red, 14 are black, 10 are blue, 06 are yellow and 04 is green.

Marbles are drawn one at a time from the bag **without replacements.**

What is the probability that,

(i) the second marble is black, given that first is a black one.

(ii) the second marble is blue or yellow, given that the first is a black.

(iii) both the marble are red

(iv) first marble is yellow and second one is red.   (12 Marks)

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

(b) In ABC company, absent percentage of the work force is 12%. Ten employees are to be selected at random for a special detailed study on 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 is absent?

(iv) What is the probability that more than eight(08) employees are absent?.   (12 Marks)

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

(b) The sales of ABC automobile in Kandy area follow a Poisson distribution with a mean of 3.00 per day.

(i)   What is the random variable in this problem?

(ii) What is the probability that no automobile is sold on a particular day?

(iii) What is the probability that **at least** one car is sold on a particular day?

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

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

(b) The lengths of service of the five executives employed in ABC IT company is as follows.

20, 22, 26, 24, 28

(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. Comment on your answer. (04 Marks)

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

(03 Marks)

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

(03 Marks)

(b) The new director of the legal Branch of the XYZ Insurance thought the mean wait time in line of 28 minutes to get the claim is too long. Therefore he introduced several measures to speed up the process. He want to check whether the mean wait time is decreased. After one month sample of 125 was selected and the mean waiting time and standard deviation was computed.

The mean waiting time was 26.9 minutes and the standard deviation was 8 minutes.

(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 they conclude that the mean wait time is less than 28 minutes at the 0.02 significance level? (04 Marks)

(08) (a) Write three properties of the normal probability distribution. (03 Marks)

(b) The mean score of a selection test is 75 with standard deviation of 08. The scores are normally distributed.

(i) What percentage of the applicants scored above 60?

(ii) What percentage of the applicants scored 70 or below?)

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

(12 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

Normal Distribution Table

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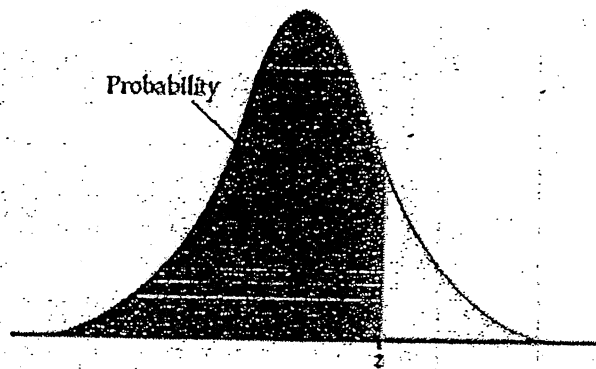
Standard normal probabilities

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	.7704	.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

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END