THE OPEN UNIVERSITY OF SRI LANKA

BACHELOR OF SOFTWARE ENGINEERING

TTZ4161 – PROBABILITY AND STATISTICS

FINAL EXAMINATION – 2010/2011

DURATION – THREE HOURS

DATE: 26th March 2011 TIME: 1400- 1700 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.

01. Compulsory Question

(A) Briefly describe the following terms used in statistics.
- (i) Sample and Population
- (ii) Statistical Inference
- (iii) Random Variable
- (iv) Probability Distribution.

(08 Marks)

(B) Following are the marks obtained by students for a assignment test,
56, 64, 48, 92, 88, 80, 54, 76, 64, 84

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

(ii) Calculate the standard deviation of the above marks. **(02 Marks)**

(C)A selected group of employees of ABC company is to be surveyed with respect to a new pension scheme. Indepth interviews are to be conducted. The employees are classified as follows.

Category	Event	Number of employees
Supervisors	A	120
Maintenance	B	50
Production	C	1460
Management	D	302
Secretarial	E	68

(i) What is the probability that the first person selected is a maintenance employee?. **(02 marks)**

(ii) What is the probability that the first person selected is either in maintenance or a secretarial? **(02 marks)**

(iii) What is the rule you used to determine the answer to question C (ii). **(02 marks)**

(iv) Are these events mutually exclusive? **(02 marks)**

(D)(i)What are the parameters which characterize the " Normal Probability Distribution"?

(ii)Write the corresponding values for Standard Normal Probability Distribution"?

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

- Area to the left of Z=1.48
- Area to the right of Z= 1.52
- Area between Z= – 1.54 and 1.83 **(03 Marks)**

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

Answer any Five questions from the below Seven questions

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

(b) A study of the quality of the ABC automobile batteries is to be conducted to estimate the number of times an engine will start before the battery fails. A sample of 40 randomly selected batteries revealed following number of starts.

26	27	26	20	21	42	30	22
22	21	26	09	21	22	28	26
19	16	20	32	18	23	32	28
21	41	19	31	21	22	16	23
30	21	37	28	39	30	21	23

(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.

(02 Marks)

(b)A recent survey conducted by the research centre of the OUSL revealed that 70% of the registered students get eligibility for the course TTZ4161.

Sample of 10 students are selected for a study.

(i)What is the random variable of in this problem? **(03 Marks)**

(ii) What is the probability that exactly 07 students were eligible?

(05 Marks)

(iii) What is the probability that more than 08 students were eligible?

(05 Marks)

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

(03 Marks)

(b)The sales of ABC Computers in Kandy area follow a Poisson Distribution with mean of 3.0 per day.

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

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

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

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

(12 Marks)

(06) (a) What do you understand by the terms 'Point estimation' and 'Interval estimation'? **(03 Marks)**

(b) In a survey the number of misspelled words in an essay given to GCE O/L Examination was counted. In a sample of 40 answer scripts the mean number of misspelled words is 6.0 and the standard deviation is 2.44

Develop,

(i) 99%, confidence interval

(ii) 95%, confidence interval and

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

(You should describe how would you obtained the answer)

(12 Marks)

(07) (a)What are the five steps involved in hypothesis testing ? **(03 Marks)**

(b) In recent years, number of companies have been formed that offer competition to Ashok Telecom(AT) in Mobile Phones packages. All advertise that their rates are lower than that of AT.and as a result their customer bills are lowered. The AT has responded by arguing that for the average consumer there will be no difference in billing. Available statistics reveals that the mean and the standard deviation of all customers using mobile phone packages are Rs 500 and Rs.20 respectively. Statistical Officer takes a random sample of 100 AT customers and calculate the mean and standard deviation of their bills.It was found that the mean is Rs 520 and standard deviation is Rs 20.

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

(ii) Compute the test statistics? **(03 Marks)**

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

(iv) Can they conclude that there is no difference between average AT bills and that of it's competitors at 0.05 level of significance? **(04 Marks)**

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

(b) The life time of a particular type of bulb is normally distributed with the mean of 3000 Hrs and standard deviation 200 Hrs.

Find the probability that one of these bulbs will last,

(i) between 3000 and 3500 Hrs **(04 Marks)**

(ii) between 2600 and 3500 Hrs **(04 Marks)**

After what number of burning hours would you expect that?

(iii) 5% of the bulbs would fail **(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

Appendix – 2

Normal Distribution Table

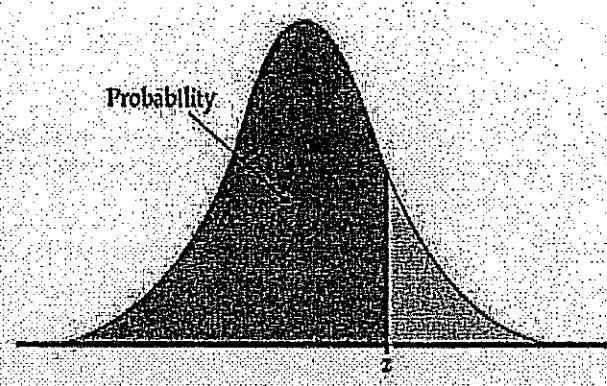

Table entry for z is the area under the standard normal curve to the left of z.

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	.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