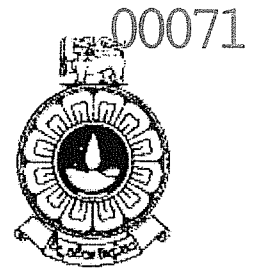THE OPEN UNIVERSITY OF SRI LANKA

DEPARTMENT OF TEXTILE AND APPAREL TECHNOLOGY

BACHELOR OF SOFTWARE ENGINEERING HONOURS

TTZ4161 – PROBABILITY AND STATISTICS

FINAL EXAMINATION – 2015/2016

DURATION – THREE HOURS

DATE: 24th November 2016   TIME: 0930- 1230hrs

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)   Sample and Population

    (ii)   Conditional probability

    (iii)   Random Variable   (06 Marks)

(B)   ABC Bank has 10 applicants for a selection test. Following are the scores

    obtained by the applicants.

    54   56   62   50   60   67   72   56   60   70

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

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

(C) From the past records, it is known that 3% of the items from a production line are

    defective. If two items are selected randomly, what is the probability that both are

    defective?   (04 Marks)

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

- Area to the right of Z=1.53
- Area between Z= − 1.32 and 2.24   (02 Marks)

(E)   Briefly describe the five steps involved in test of hypothesis.   (04 Marks)

(F)   Let us suppose that ABC food company is concerned that some packets of milk food they are producing are significantly underweight. The weight of the packet should be 450g. Company wants to check whether packets are underweight . Write the appropriate set of hypotheses.   (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 marks obtained by a group of students in the assessment test.

51	62	82	83	32
22	24	84	64	25
34	36	52	58	57
66	68	69	32	53
54	66	86	82	36
37	55	56	68	63

   (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)The data in the table below gives the type of degree obtained by the Executive staff of the leading Company.

Age(Years)	Bachelor Degree	Masters Degree	Total
Less than 25	150	30	180
25-40	40	20	60
More than 40	30	20	50
	220	70	290

If an executive is selected at random from the company, find

   (i).   the probability that he is more than 40 years of age.
   (ii). the probability that he has a Bachelor Degree, given that he is less than 25 years of age.
   (iii). the probability that he has a Masters Degree, given that he is between 25 – 40 Years of age.
   (iv). the probability that he is less than 25 years in age ,given that he has a Master Degree

(12 Marks)

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

(03 Marks)

(b) In a recent study, it was found that 70% of the homes in the Western Province have computers. Ten homes were selected 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 that all 10 have computers?

   (iv) What is the probability that more than eight(08)homes have computers?

(12 Marks)

(05) (a) State three (03) applications of 'Poisson probability distribution'.

(03 Marks)

(b) Council of the University is interested in finding the probability that telephone switch board in the university receives more than 5 calls a minute. Past records show that average 120 calls per hour are received by the switch board.

(Assume that the probability of arrival of a call is same and arrival of one call is not depend upon the arrival of another call)

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

(ii) What is the probability that no call arriving in given one minute?

(iii) What is the probability that five calls or less ($\leq$ 5) arriving in given one minute?

(iv) If the switch board cannot handle more than 5 incoming calls a minute, what is the probability that the switch board will be overloaded during a minute?

(12 Marks)

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

(b) The number of hours spend by five students in the BSE programme are as follows.

2, 4, 6, 8, 10

(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) A recent survey found that high school student watched an average of 6.8 videos per month. A random sample of 36 university students revealed that the mean number of videos watched by last month was 6.6 ,with a standard deviation of 0.5. At the 0.05 significance level, can we conclude that university students watch fewer videos than high school students?

      (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 university students watch fewer videos than high school students? (04 Marks)

(08) (a) What are the importance of the standard normal probability distribution. (03Mark

(b)In a university, there is a selection test to offer the different programmes of study for the students

Following guide lines are used.

- The top 20% of the students who scored high marks are offered more demanded programmes.
- The weak 5% of the students who got lower marks are not offered any of the programmes.

The mean score of a selection test is 80 with standard deviation of 10. The scores are normally distributed.

      (i) What percentage of the applicants scored above70?

      (ii) Calculate the cut-off marks of students who are selected more demanded programmes.

      (iii) What is the minimum mark to select for any of the programmes?

                                     (12 Marks)

POISSON DISTRIBUTION: PROBABILITY OF EXACTLY X OCCURRENCES

X	μ 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

X	μ 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

Probability

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

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