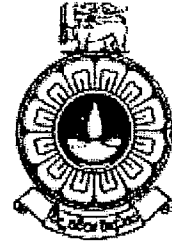


THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF SOFTWARE ENGINEERING
TTZ4161 – PROBABILITY AND STATISTICS
FINAL EXAMINATION – 2012/2013



00037

DURATION – THREE HOURS

DATE: 24th 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.

01. Compulsory Question

- (A) Briefly describe the following terms used in statistics.
- (i) Inferential Statistics
 - (ii) Random Variable
 - (iii) Mutually Exclusive events.

(06 Marks)

- (B) Following are the runs scored by a batsman in 10 innings of cricket matches.

20, 17, .26, 64, 48, 92, 38, 40, 54, 57

- (i) Calculate the mean and median of the runs. **(02 Marks)**
- (ii) Calculate the standard deviation of the above runs. **(02 Marks)**

- (c) The city police classifies crimes on their records by age of the criminal and whether the crime is violent or non-violent. As shown below, a total of 150 crimes were reported in last three months.

Type of crime	Age of the criminal			Total
	Under 20yrs	20-40 yrs	40yrs or older	
Violent	27	41	14	82
Non-Violent	12	34	22	68
Total				150

- (a) What is the probability of selecting a case to analyze and finding that it involved a non violent crime?, **(02 Marks)**
- (b)) What is the probability of selecting a case to analyze and finding that the crime was committed by someone less than 40 years? **(02 Marks)**
- (c)) What is the probability of selecting a case that involves a violent crime or an offender less than 20 years old?. **(02 Marks)**
- (d) Given that a violent crime is selected for analysis, What is the probability that the crime was committed by a person under 20 years of age? **(02 Marks)**
- (D)(i)What are the parameters which characterize the “ Normal Probability Distribution”? **(01 Marks)**
- (ii)Write the corresponding values for “Standard Normal Probability Distribution”? **(01 Marks)**
- (iii)Determine the area under the Standard Normal curve for following situations.
- Area to the left of $Z=1.32$
 - Area to the right of $Z= 1.24$
 - Area between $Z= - 1.32$ and 1.83 **(01 Marks)**
- (E)State the five steps involved in Hypothesis Testing **(04 Marks)**

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

- (02)** (a) Describe the importance of the measures of dispersion in a given set of data. **(03 Marks)**
- (b) Following are the marks obtained by students for an assignment test. (Marks have given out of 50).

08	12	32	18	19	08
36	42	18	08	17	17
26	28	25	37	35	24
15	18	10	19	17	35
26	24	31	27	14	12

- (i) Arrange them in a frequency table. **(04 Marks)**
- (ii) Calculate mean, and median of the data. **(04 Marks)**
- (iii) Calculate the variance, and standard deviation of the marks. **(04 Marks)**

- (03)** (a) Explain , what do you understand by “Sampling distribution of means”

(03 Marks)

- (b) A population consists of following four values:

2, 4, 6, 8, 10

- (i) How many samples of sample size 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 and comment on the results **(03 Marks)**
- (iv) State the “Central Limit Theorem” and describe its importance in statistics.

(04 Marks)

(04) (a) Write the mathematical formula of the "Binomial probability distribution". 00
(02 Marks)

(b) A recent survey conducted by the research centre of the OUSL revealed that 60% of the registered students get eligibility for the course TTZ4161.

Sample of 12 students are selected for a study.

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

(ii) What is the probability that exactly 10 students were eligible?

(05 Marks)

(iii) What is the probability that more than 10 students were eligible?

(05 Marks)

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

(b) Senior Management Committee is interested in finding the probability that a telephone switch board at the University office receives more than five (05) calls in a minute. Past records show that an average of 180 calls per hour are received by this switch board.

(i). What is the probability that no calls received in a minute by this switch board.

(ii). Write the probability distribution for this situation.

(iii). What is the probability that more than five calls received per minute by this switch board. (12 Marks)

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

(b) In a survey, one of the interests is to find out the monthly income of a junior Software Technical officer in the industry. A random sample of 250 Software Technical officers were selected for the study. The sample mean computed was Rs 35,000 with standard deviation is Rs 2000. Develop,

(i) 99%, confidence interval

(ii) 95%, confidence interval and

(iii) 92% confidence interval for the mean monthly income of the Junior Software Technical officers (12 Marks)

(You should describe how would you obtained the answer)

(a) What do you mean by the term "Hypothesis Testing"? **(03 Marks)**

(b) In recent national survey reveal that high school students watched an average of 6.8 videos per month. Authorities wants to know whether primary students watch fewer videos per month. A random sample of 36 primary students revealed that the mean number of videos watched last month was 6.2, with a standard deviation 0.5.

(i) State the "Null Hypothesis" and the "Alternate Hypothesis"

(02 Marks)

(ii) Compute the test statistic.

(03 Marks)

(iii). What is the decision rule?

(03 Marks)

(iv) At the 0.05 significant level, can they conclude that primary students watch fewer videos than high school students?

(04 Marks)

8) (a) Write three properties of the normal probability distribution.

(02 Marks)

(b) The number of days sick leave requested annually by employees of a company is normally distributed with a mean of 9 days and standard deviation of 2.5 days..

(I) What percentage of the employees request 9 days of sick leave or more? **(03 Marks)**

(II) What percentage of the employees request at least 10 days sick leave? **(05 Marks)**

(iii) How many employees use less than 2 days sick leave annually, If the number of employees in that company is 600? **(05 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

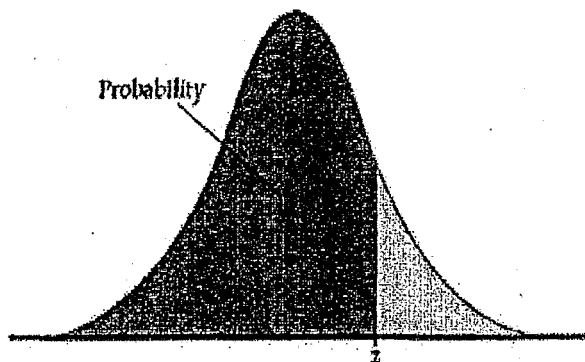


Table entry for z is the area under the standard normal curve to the left of z .

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

(71)