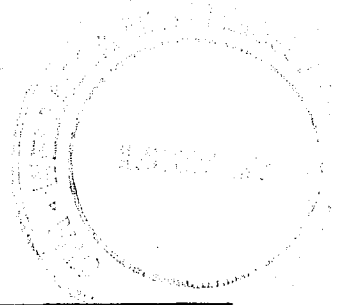


Uva Wellassa University, Sri Lanka
 B.Tech. Degree Programme - 2006/07
 BSc.(Computer Science) Degree Programme - 2006/07
 End Semester Examination- Semester 2
 June/July 2008
 STA 201-2 Statistical Methods I



Answer All Questions

B: Essay Questions

Time: One (1.00) hour and 40 minutes (Suggested)
 Total marks 85

- 1) A glass bottle manufacturing company has recorded data on the average number of defects per 10,000 bottles and the number of weeks since the last machine service. A part of the MINI TAB output is given from the analysis of data as below.

Observation	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Defects (per 1000)	13	16.1	14.5	17.8	22	27.4	16.8	34.2	65.6	49.2	66.2	81.2	87.5	114.5
Weeks	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Predictor	Coef.	St.Dev .	T	p
Constant	-31.698	9.776	-3.24	0.007
X	7.2767	0.8692	8.37	0.000

ANOVA

Source	DF	SS	MS	F	P
Regression	----	----	----	----	0.000
Residual	----	2062	----		
Total	----	14109			

Answer the following questions:

- What is the fitted model?
- What is the hypothesis that you intend to test in ANOVA table?
- Complete the ANOVA table
- What is your conclusion in ANOVA table based on P-value?
- What can you say about the significance of the coefficients?
- Proportion of variation in data explained by the regression relation is:

(20 marks)

- 2) A certain organization intends to buy an instrument to measure the purity of drinking water in Colombo city. There are three different types of instruments to choose from. When a water sample is provided, each type of instrument can measure the purity automatically. Therefore, only one technician is enough to operate any instrument. It is very important that an instrument be able to provide purity measurements quickly. So, the organization has decided to test the instruments before choosing one. It wants to compare the time periods that these instruments take to analyze a water sample. It is known that the time depends on the source of water (place), from where the water is obtained.

Suppose that the organization seeks your help to design an experiment and analyze the data to determine whether 'the costs of time taken to analyze a water sample are the same for each instrument'. The cost of analyzing one water sample is the same for each instrument. Suppose that you are provided enough money for 18 tests and a technician who is familiar with all three instruments. Design an appropriate experiment and explain how you analyze the data. Your answer should include.

- a) The type (name) of design that you wish to employ
- b) Steps of the experiment
- c) Hypotheses that you intend to test
- d) Your assumptions
- e) A rough sketch of the ANOVA table that you wish to construct
- f) How you will make a decision

(25 marks)

- 3) Two research laboratories have independently produced drugs that provide relief to arthritis sufferers. The first drug was tested on a group of 90 arthritis victims and produces an average of 8.5 hours of relief, with standard deviation of 1.8 hours. The second drug was tested on 80 arthritis victims, producing an average of 7.9 hours of relief, with standard deviation of 2.1 hours. At the 0.05 level of significance, does the second drug provide a significantly shorter period of relief?

(10 marks)

- 4) A large construction firm estimates that the time required to complete an office complex is normally distributed with a mean of 18 months and standard deviation of 2 months.

- a) What is the probability that it will take at least 20 months to complete the office complex?
- b) What is the probability that it will be completed less than 21 months?
- c) If the firm wishes to make a bid on the project, quoting a completion time that has a 90% chance of meeting, how many months should it quote.

(15marks)

- 5) An employee at InfoTech must enter product information into the computer. The employee may use a light pen that transmits the information to the PC along with the keyboard to issue commands, or fill out a bubble sheet and tie it directly into the old mainframe. Historically, we know the following probabilities:

$P(\text{Light pen will fail}) = 0.025$

$P(\text{PC keyboard will fail}) = 0.15$

$P(\text{Light pen and PC keyboard will fail}) = 0.005$

$P(\text{mainframe will fail}) = 0.25$

Data can be entered into the PC only if both the light pen and keyboard are functioning. Assume they cannot both fail at the same time.

- a) What is the probability that the employee can use the PC to enter data?
b) What is the probability that either the PC fails or the mainframe fails?

(10 marks)

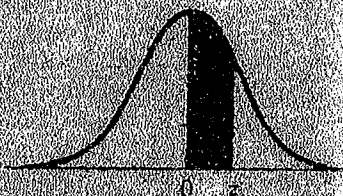
- 6) The 'Finally Iron Works', manufacturer of nails, has found that 3% of the nails produced are defective. Suppose that a random sample of 300 nails is examined what is the probability that the proportion defective is between 0.02 and 0.035?

(05 marks)



Table 3: AREA OF A STANDARD NORMAL DISTRIBUTION

An entry in the table is the proportion under the entire curve which is between $z = 0$ and a positive value of z . Areas for negative values of z are obtained by symmetry.



z	00	01	02	03	04	05	06	07	08	09
0.0	0000	0040	0080	0120	0160	0199	0239	0279	0319	0359
0.1	0398	0438	0478	0517	0557	0596	0636	0675	0714	0753
0.2	0793	0832	0871	0910	0948	0987	1026	1064	1103	1141
0.3	1179	1217	1255	1293	1331	1368	1406	1443	1480	1517
0.4	1554	1591	1628	1664	1700	1736	1772	1808	1844	1879
0.5	1915	1950	1985	2019	2054	2088	2123	2157	2190	2224
0.6	2257	2291	2324	2357	2389	2422	2454	2486	2517	2549
0.7	2580	2611	2642	2673	2703	2734	2764	2794	2823	2853
0.8	2881	2910	2939	2967	2995	3023	3051	3078	3106	3133
0.9	3159	3186	3212	3238	3264	3289	3315	3340	3365	3389
1.0	3413	3438	3461	3485	3508	3531	3554	3577	3599	3621
1.1	3643	3665	3686	3708	3729	3749	3770	3790	3810	3830
1.2	3849	3869	3888	3907	3926	3944	3962	3980	3997	4015
1.3	4032	4049	4066	4082	4099	4115	4131	4147	4162	4177
1.4	4192	4207	4222	4236	4251	4265	4279	4292	4306	4319
1.5	4332	4345	4357	4370	4382	4394	4406	4418	4429	4441
1.6	4452	4463	4474	4484	4495	4505	4515	4525	4535	4545
1.7	4554	4564	4573	4582	4591	4599	4608	4616	4625	4633
1.8	4641	4649	4656	4664	4671	4678	4686	4693	4699	4706
1.9	4713	4719	4726	4732	4738	4744	4750	4756	4761	4767
2.0	4772	4778	4783	4788	4793	4798	4803	4808	4812	4817
2.1	4821	4826	4830	4834	4838	4842	4846	4850	4854	4857
2.2	4861	4864	4868	4871	4875	4878	4881	4884	4887	4890
2.3	4893	4896	4898	4901	4904	4906	4909	4911	4913	4916
2.4	4918	4920	4922	4925	4927	4929	4931	4932	4934	4936
2.5	4938	4940	4941	4943	4945	4946	4948	4949	4951	4952
2.6	4953	4955	4956	4957	4959	4960	4961	4962	4963	4964
2.7	4965	4966	4967	4968	4969	4970	4971	4972	4973	4974
2.8	4974	4975	4976	4977	4977	4978	4979	4979	4980	4981
2.9	4981	4982	4982	4983	4984	4984	4985	4985	4986	4986
3.0	4987	4987	4987	4988	4988	4989	4989	4989	4990	4990