LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **STATISTICS**

FIFTH SEMESTER – NOVEMBER 2007

ST 5503 - COMPUTATIONAL STATISTICS

BB 13

Date : 01/11/2007 Dept. No. Max. : 100 Marks
Time : 9:00 - 12:00

ANSWER ANY THREE QUESTIONS.

1.(a) For the following data:

Commodity	Base year		Current year	
	Kg.	Rate(RS.)	Kg.	Rate(RS.)
Onion	12	14	15	18
Meat	10	160	12	200
Sugar	15	12	18	20
Coffee	10	160	16	220
Oil	12	55	15	80

Find (i) Laspyre (ii) Paasche (iii)Dorbish-Bowley (iv) Marshall-Edgeworth and (v)Fisher price and quantity index numbers. (10 marks)

(b) Fit a trend line by the method of least squares for the following data:

Year :	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
(Annul Profit in crores):	10	12	16	22	26	28	31	34	38	44

Also estimate the trend values for the years from 2000 to 2005.Further compute 3 year and 4 year moving averages. (14 marks)

(c) The demand for a particular spare part in a factory was found to vary from day-to-day. In a sample study the following information was obtained:

Day :	Mon.	Tue.	Wed.	Thu.	Fri .	Sat.
No.of parts demanded :	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week. Use .01 significance level. (10 marks)

[OR]

(d) Calculate the monthly seasonal indices for the three years of expenses for a six-unit apartment house in southern Florida as given here. Use a 12-month moving average calculation.

Expenses

Month	**1995**	**1996**	**1997**
January	172	182	192
February	182	207	212
March	202	212	232
April	232	247	282
May	242	267	292
June	312	332	392
July	362	402	422
August	292	337	332
September	242	262	292
October	242	272	297
November	232	257	282
December	197	222	252

(20 marks)

(e) The following table gives probabilities and observed frequencies in four classes AB,Ab,aB and ab in a genetical experiment. Estimate the parameter θ by the method of maximum likelihood and its standard error.

Class	**Probability**	**Observed frequency**
AB	¼(2+θ)	110
Ab	¼(1-θ)	29
aB	¼(1-θ)	32
ab	¼ (θ)	10

(14 marks)

2(a) The National Association of Home Builders provided data on the cost of the most popular home remodeling projects. Sample data on cost in thousands of dollars for two types of remodeling projects are as follows.

Hall :	18.2	19.4	20.5	24.5	21.3	24.6	23.4	26.2	24.1	25.2
Kitchen :	16.4	17.8	19.5	20.6	18.7	22.6	21.4	25.3	22.4	

Set-up a 99% confidence interval for the difference between the two population means. [10 marks)

(b)Measurements of the fat content (in grams) of two kinds of ice cream, Brand A and Brand B, yielded the following sample data:

Brand A:	13.5	14.0	13.6	12.9	13.0	12.4	13.7	12.8
Brand B:	12.9	13. 0	12.4	13.5	12.6	13.2	12.8	13.5

Test the hypothesis $\mu_1 = \mu_2$ (where μ_1 and μ_2 are the respective true average fat contents of the two kinds of ice cream),against the alternative hypothesis $\mu_1 \neq \mu_2$ at 0.05 significance level. (14 marks)

(c) The nicotine content (in milligrams) of two samples of tobacco were found to be as follows:

Sample A:	24	27	26	21	25	23	27	26	22	28
Sample B:	27	30	28	31	22	36	24	32	25	21

Test whether the two populations have the same variances. Use 0.01 significance level (10 marks)

[OR]

(d) The following is the distribution of the hourly number of trucks arriving at a company's warehouse :

Trucks arriving per hour:	0	1	2	3	4	5	6	7	8
Frequency :	52	151	130	102	45	12	5	1	2

Fit a Poisson distribution to the above data and test the goodness of fit at 0.05 significance level. (14 marks)

(e) 1072 college students were classified according to their intelligence and economic conditions. Test whether there is any association between intelligence and economic conditions at 5% significance level.

	Intelligence			
	Excellent	**Good**	**Mediocre**	**Dull**
Economic conditions				
Good	48	199	181	82
Not good	81	185	190	106

(10 marks)

(f) The 1997 price/earnings ratios for a sample of 12 stocks are shown in the following list . Assume that a financial analyst has provided the estimated price/earnings ratio for 1998.Using a 0.05 level of significance ,what is your conclusion about the differences between the price/earnings ratios for 1997 and 1998 ? Use Wilcoxon signed ranks.

Stock	**1997 P/E Ratio**	**1998 P/E Ratio(Est)**
Coca-cola	40	32
Du Pont	24	22
Eastman Kodak	12	23
General Electric	30	23
General Mills	25	19
IBM	19	19
McDonald's	20	17
Merk	29	19
Motorala	35	20
Philip Morris	17	18
Walt Disney	33	27
Xerox	20	16

(10 marks)

3.[a] The data given below for a small tiger population which exhibits a steady rising trend. Each column represents a systematic sample and rows represent the strata.

i] Calculate sampling variance under systematic sampling [10]

ii] Calculate sampling variance under stratified sampling [10]

iii] Calculate sampling variance for without stratification and without replacement [14]

Sample Number

Stratum #	**1**	**2**	**3**	**4**
I	4	9	14	20
II	6	10	17	28
III	8	12	19	30
IV	12	16	22	36

[OR]

[b]. The data given below represent the summary of wheat farm census of all the 1000 farms in a region. The farms were stratified according to farm size (in acres) into five strata. Estimate the sampling variance of the sample mean:

i] When the farms are selected by the method of simple random sampling without replacement. [10]

ii] When the farms are selected by the method of Stratified random sampling with proportional allocation (i.e: n_i proportional to N_i). [10]

iii] When the farms are selected by the method of Stratified random sampling with Neyman optimum allocation(i.e: n_i proportional to N_iS_i). [10]

iv] Compare the efficiency of above method. [4]

Stratum Number	Farmsiz (in acres)	No.of farms (N_i)	Average Area Y_{Ni}	Std. Deviation σi
1	0-50	300	16	2
2	51-100	250	17	4
3	101-150	150	14	3
4	151-200	150	15	2
5	201-250	150	16	1

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