

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – STATISTICS

FIFTH SEMESTER – NOVEMBER 2009

ST 5503 - COMPUTATIONAL STATISTICS

Date & Time: 10/11/2009 / 9:00 - 12:00 Dept. No.

Max. : 100 Marks

Answer ALL the Questions. Each question carries 20 marks.

1. a). A population consists of five numbers 2,3,6,8 and 11. Consider all possible samples of size two which can be drawn with replacement from this population. Calculate the standard error of sample mean. Also calculate the standard error of sample mean when the samples of size two are drawn without replacement.

(OR)

- b). A survey of 200 families with 4 each revealed the following distribution.

No.of boys	:	0	1	2	3	4
No.of families	:	8	48	76	54	14

Assume that X has binomial distribution with parameter (4, p), where p is the probability of a child being a boy. Obtain the maximum likelihood estimate (MLE) of p and the MLE of the probability that a randomly selected family has at least 3 boys.

- c). An absolute sample of 11 mathematical scores are assumed to be $N(\mu, \sigma^2)$. The observations are 26, 31, 27,28, 29, 28, 20, 29, 24, 31, 23. Find a 95% confidence interval of σ . **(12+8)**

2. a). Consider the following data:

X_1 :	25	30	45	52	65	75	80	42	50	60
X_2 :	60	40	35	50	60	72	63	40	55	62

Test whether the two population variances are equal. Use 5% significance level.

- b). Below is the distribution of hair colours for either sex in a University.

		Hair colour				
		Fair	Red	Medium	Dark	Jet black
Sex	Boys	592	119	849	504	36
	Girls	544	97	677	451	14

Test the homogeneity of hair colour for either sex. Use 5% significance level. **(12+8)**

(OR)

c). In a sample of 1650 men from a large city, 400 are found to be drinkers. In another city 500 out of 1900 are found to be drinkers. Test whether the cities are significantly different with respect to drinking habit.

d). A time study engineer develops new sequence of operation elements. He hopes that it will reduce the mean cycle time of a certain production process. The result of a time study of 20 cycles is given below.

12.25 11.97 12.15 12.08 12.31 12.28 11.94 11.84 12.16 12.04
12.09 12.15 12.14 12.47 11.98 12.04 12.11 12.25 12.15 12.34

The present mean cycle is 12.5 minutes. Test whether the engineer adopts the new sequence of operation element.

(8+12)

3. a). The following are the weight gains (in pounds) of two random samples of young Indians fed on two different diets but otherwise kept under identical conditions:

Diet I: 16.3 10.1 10.7 13.5 14.9 11.8 14.3 10.2 12.0 14.7
23.6 15.1 14.5 18.4 13.2 14.0
Diet II: 21.3 23.8 15.4 19.6 12.0 13.9 18.8 19.2 15.3 20.1
14.8 18.9 20.7 21.1 15.8 16.2

Use Wilcoxon test at 0.01 level of significance to test the null hypothesis that the two population samples are identical. .

(OR)

b). A vendor of milk products produces and sells low fat dry milk to a company that uses it to produce baby formula. In order to determine the fat content of the milk, both the company and the vendor take a sample from each lot and test it for fat content in percent. Ten sets of paired test results are

Lot number	Company Test Results (X)	Vendor Test Results (Y)
1	0.50	0.79
2	0.58	0.71
3	0.90	0.82
4	1.17	0.82
5	1.14	0.73
6	1.25	0.77
7	0.75	0.72
8	1.22	0.79
9	0.74	0.72
10	0.80	0.91

Let $D = X - Y$ and let m_D denote the median of the differences.

Test $H_0 : m_D = 0$ against $H_1 : m_D > 0$ using the **sign test**. Let $\alpha = 0.05$ approximately.

4. a). Fit a straight line by the method of least squares for the following data and also forecast the earnings for the year 2010.

Year	:	1999	2000	2001	2002	2003	2004	2005
Earnings (Lakhs)	:	15	14	18	20	17	24	27

- b). Calculate five yearly moving averages of number of students studying in a college from the following data.

Year	:	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
No.of students.	:	332	317	357	392	402	405	410	427	405	438

(10+10)

(OR)

- c). Calculate the seasonal indices for the data given below by the link relative method.

Quarter	Years				
	2004	2005	2006	2007	2008
I	45	48	49	52	60
II	54	56	63	65	70
III	72	63	70	75	84
IV	60	56	65	72	66

5. a). From the following data calculate the seasonal indices by the ratio to moving average method.

Year	1 st Quarter	2 nd Quarter	3 rd Quarter	4 th Quarter
2004	68	65	61	63
2005	65	58	56	61
2006	68	63	63	67
2007	70	59	56	62
2008	60	55	51	58

(OR)

- b). For the following data calculate the Laspeyre's, Paasche's, Fisher's and Kelly's price index numbers for 2005.

Item	2000		2005	
	Price (in Rs.)	Quantity	Price (in Rs.)	Quantity
A	15	15	22	12
B	20	5	27	4
C	4	10	7	5
