LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – APRIL 2010

ST 5503 - COMPUTATIONAL STATISTICS

Date & Time: 03/05/2010 / 1:00 - 4:00 Dept. No.   Max. : 100 Marks

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Answer ALL the Questions. Each question carries **20** marks.

1. a). Construct a sampling distribution of the sample mean for the following population when
    random sample of size 2 are taken from it (a)with replacement and (b)without replacement.
    Also find mean and standard error of the distribution in each case.

Population Unit :	1	2	3	4
Observation :	22	24	26	28

    (OR)

    b). In a genetical experiment the frequencies observed in four classes are 1997, 906, 904, and

    32. Theory predicts that there should in a proportion to $\dfrac{1+\theta}{4}, \dfrac{1-\theta}{4}, \dfrac{1-\theta}{4},$ and $\dfrac{1+\theta}{4},$

    $0 < \theta < 1$. Find the maximum likelihood estimator of the parameter θ and also obtain the
    estimate of its Variance.

    c). Obtain 90% Confidence interval for the mean of the normal population. The data are
    given below.

10	6	16	17	13	12	8	14	15	9	7	13
22	15	12	14	18	8	21	23	10	17	25	18
12	19	27	34	39	23	11	24				

    (12+8)

2. a). Two horses A and B were tested according to the time (in seconds) to run a particular
    distance with the following results:

Horse A :	30	32	34	35	36	31	37	38
Horse B :	31	33	31	27	28	32	35	

    Test whether the two horses have the same running capacity. Use 5% significance level.

    b).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	5224	5229	5210	5225	5229	5215

    Using chi-square test, test the hypothesis that the number of parts demanded do not depend on the day of
    the week. Use 1% significance level. **(12+8)**

    (OR)

    c). In a sample of 650 men from a large city, 400 are found to be smokers. In another city 500 out
    of 900 are found to be smokers. Test whether the cities are significantly different with
    respect to smoking habit.

d). In a pediatric clinic, a study is carried out to test the effectiveness of aspirin in reducing temperatures. The temperatures of twelve, five-year old children suffering from influenza were observed before and after one hour of administering aspirin and the paired observations are reported as below:

Patient	Temp (F^0) before taking aspirin	Temp (F^0) 1 hr after taking aspirin
1	102.4	99.6
2	103.2	101.1
3	101.9	101.2
4	103.0	102.1
5	101.2	99.8
6	100.7	101.2
7	102.5	101.0
8	101.1	100.1
9	102.8	100.7
10	102.3	101.1
11	102.9	101.3
12	102.4	100.2

Test whether aspirin is effective in reducing the temperature at 5% level of significance. **(8+12)**

3. a). Let m be the median lung capacity in litres for a male freshman. Use sign test for testing at $\alpha = 0.0768$ level, the null hypothesis Ho : m = 4.7 against the alternative hypothesis H_1 : m > 4.7. The observations are:

7.6 5.4 4.3 5.0 5.7 6.2 4.8 4.7 5.6 5.2 3.7 4.0 5.6 6.8 4.9 3.8 5.6

 b). Test for randomness for the following data based on run test :

15 77 01 65 69 58 40 81 16 20 00 84 22 28 26 46 66 16
36 86 66 17 43 49 85 40 51 40 10 **(10+10)**

(OR)

c). Let X and Y denote the weights of ground cinnamon in 120 gram tins packaged by companies A and B respectively. Use Wilcoxon test for testing the hypothesis $H_0 : \pi_x = \pi_y$ against $H_0 : \pi_x < \pi_y$. The weights of $n_1 = 8$ and $n_2 = 8$ tins of cinnamon packages by the companies A and B selected at random yielded the following observations of X and Y respectively.

X: 117.1   121.3   127.8 121.9 117.4   124.5   119.5   115.1
Y: 123.5   125.3   126.5 127.9 122.1   125.6   129.8   117.2

4. a). Calculate the 4 yearly moving average and 5 yearly moving average of the following data. Obtain   trend values and give their graphical representation.

Year	Output (in 1000's)	Year	Output (in 1000's)
1990	4	1998	8
1991	5	1999	7
1992	6	2000	6
1993	7	2001	8
1994	9	2002	9
1995	6	2003	10
1996	5	2004	7
1997	7	2005	9

(OR)

b). Calculate the seasonal variations by the Ratio to trend method for the data given below.

Quarter	Years				
	2004	2005	2006	2007	2008
I	30	34	40	54	80
II	40	52	58	76	92
III	36	50	54	68	86
IV	34	44	48	62	82

5. a). The following data relate to price of rice per Kg. in different years.

Year   :   1996   1997   1998   1999   2000   2001   2002   2003
Price in Rs. :   6   7   7   8   10   14   12   13

Find out the following price relatives:
   i)   Taking 1996 as base
   ii) Taking 2000 as base
   iii) Taking average of 1996,1997and 1998 as the base
   iv) Calculate link relative.

(OR)

b). For the following data calculate the Laspeyre's, Paasche's, Marshall Edgeworth's price and quantity index numbers.

	Base year		Current year	
Item	Price (in Rs.)	Quantity	Price (in Rs.)	Quantity
A	4.00	58500	6.00	62000
B	3.50	15630	5.50	13050
C	3.00	26230	5.00	25000
D	2.50	11360	4.00	10000
E	2.00	30000	3.00	37500

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