Year: 2068

Group A

Attempt any Two (10 x 2 = 20)

1. Write the importance of sampling over census. Describe systematic sampling. In a population with N = 6 the values of Y are 8, 3, 1, 11, 4 and 7. Calculate the sample Mean $\bar{y}$ for all possible simple random samples without replacement of size 2. Verify that $\bar{y}$is an unbiased estimate of $\overline{Y}$.

2. The following data represent the operating times in hours for three types of scientific pocket calculators before a recharge is required:

Calculator A	4.9	6.1	4.3	4.6	5.3	5.5
Calculator B	5.4	6.2	5.8	5.5	5.2	4.8
Calculator C	6.4	6.8	5.6	6.5	6.3	6.6

Use the Kruskal-Wallis test, at the 0.01 level of significance, to test the hypothesis that the operating times for all three calculators are equal.

3. The following table shows the scores(Y) made by ten assembly line employees on a test designed to measure job satisfaction. It also shows the scores made on an aptitude test (X_1) and the number of days absent(X_2) during the past year (excluding vacations).

Y	X_1	X_2
70	6	1
60	6	2
80	8	1
50	5	8
55	6	9
85	9	0
75	8	1
70	6	1
72	7	1
64	6	2

The summation values are as following:

$\sum Y = 681$, $\sum X1 = 67$ $\sum X2 = 26$ $\sum X_1Y = 467$ $\sum X_2Y = 1510$

$\sum X_1X_2 = 153$ $\sum Y^2 = 47455$ $\sum X_1^2 = 463$ $\sum X_2^2 = 158$

(i) Calculate the least squares equation that best describes these three variables.

(ii) Predict the value of scores when aptitude test is 7 and number of days absent is 6.

Group B

Answer any eight questions: (8 x 5 = 40)

4. Show that in simple random sampling without replacement sample mean is unbiased estimate of population mean.

5. What do you mean by partial correlation coefficient? State the relationship between simple and partial correlation coefficient when there are three variables. If r_{12}= 0.5 , r_{23} = 0.1 and r_{13} = 0.4, compute $r_{12.3}$ and $r_{23.1}$

6. Explain two stage sampling with sample mean and corresponding variance.
7. Differentiate parametric and non parametric test.
8. In an industrial production line, items are inspected periodically for defectives. The following is a sequence (from left to right) of defective items, D, and non defective items, N, Produced by this production line:

D	D	N	N	N	D	N	N	D	D
N	N	N	N	N	D	D	D	N	N
D	N	N	N	N	D	N	D		

Use run test with a significance level 0.05 to determine whether the defectives are occurring at random or not.

9. Use the sign test to see whether there is a difference between the numbers of days required days required to collect an account receivable before and after a new collection policy. Use the 0.05 significance level.

Before	33	36	41	32	39	47	34	29	32
After	35	29	38	34	37	47	36	32	30

10. A random sample of 200 married men, all retired, was classified according to education and number of children.

Education	**Number of Children**		
	0-1	2-3	Over 3
Elementary	14	37	32
Secondary	19	42	17
College	12	17	10

Test the hypothesis, at the 0.05 level of significance, that the number of children is independent of the level of education attained by the father.

11. Write Cobb-Douglas production function with interpretation of the regression coefficients.
12. Suppose the residuals for a set of data collected over 8 consecutive time periods are as follows:

Time Period:	1	2	3	4	5	6	7	8
Residuals:	-4	-3	-3	-2	1	1	3	7

Compute the first order autocorrelation.

13. Explain the term multicollinearity and describe a situation where the problem of multicollinearity arises?