

(3 Hours)

[Total Marks : 100]

- N.B. :**
- (1) Attempt any five questions. Each question is of 20 marks.
  - (2) Question No. 1 is compulsory.
  - (3) Scientific calculator can be used.
  - (4) Appropriate Statistical Tables can be used.

1] (a) 5

A sample of 16 ten-year old girls had a mean weight of 71.5 pounds and a S.D. of 12 pounds respectively. Assuming normality, find the 90, 95 and 99 percent confidence intervals for  $\mu$ .

(b) 5

The following table shows the outcome of 500 interviews completed during a survey to study the opinions of residents of a certain city about legalized abortion. The data are also classified by the area of the city in which the questionnaire was attempted.

Area of city	Outcome		
	For (F)	Against (O)	Undecided (R)
A	100	20	5
B	115	5	5
D	50	60	15
E	35	50	40

If a questionnaire is selected at random from the 500, what is the probability that:

1. The respondent was against legalized abortion?
2. The respondent lived in area A?
3. The respondent was for legalized abortion, given that he/she resided in area D
4.  $P(A \cap R)$
5.  $P(Q \cup D)$

(c) 5

The table given below shows the lifetimes in hours of samples from three different types of television tubes manufactured by a company. Test at the 0.05 significance level whether there is a difference in the three types. (Given :  $F_{0.05}(2,9) = 4.26$ ). It is convenient to subtract a suitable number, say, 400.

Sample 1	407	411	409
Sample 2	404	406	408
Sample 3	410	408	406

[TURN OVER]



6

3) (a)

Hartgers et al. (A-17), of the Department of Public Health and Environment in Amsterdam, conducted a study in which the subjects were injecting drug users (IDUs). In a sample of 194 long-term regular methadone (LTM) users, 145 were males. In a sample of 189 IDUs who were not LTM users, 113 were males. Construct a) 90 b) 95 c) 99 percent confidence interval for difference between the proportions of males in the two populations.

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(b)

The face sheet of patients' records maintained in a local health department contains 10 entries. A sample of 100 records revealed the following distribution of erroneous entries.

No. of erroneous entries (out of 10)	0	1	2	3	4	5 or more
No. of records	8	25	32	24	10	1

Test the goodness - of - fit of these data to the binomial distribution with  $p = .2$ .

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- (c) The table shows the yield per acre of four different plant crops grown on lots treated with three different types of fertilizer. Test at .01 level of significance whether there is a significant difference in yield per acre due to fertilizers

	Crop1	Crop2	Crop3	Crop4
Fertilizer A	4.5	6.4	7.2	6.7
Fertilizer B	8.8	7.8	9.6	7
Fertilizer C	5.9	6.8	5.7	5.2

Use two way ANOVA to determine whether treatment effects are equal or not.

( Given :  $F_{0.05}(2,8) = 4.46$  )

[ TURN OVER



4]

(a)

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In an article in the *American journal of Public Health*, Colsher describe the results of a health survey of 119 male inmates 50 years of age and older residing in a state's correctional facilities. They found that 21.6 percent of the respondents reported a history of venereal disease. On the basis of these findings, can we conclude that in the sampled population more than 15 percent have a history of a venereal disease? Let  $\alpha = 0.05$ .

- (b) Concern about acquired immunodeficiency syndrome (AIDS) was the motivation for a survey conducted by Professor Patty J. Hale of the University of Virginia. She used a mailed questionnaire to survey businesses. Among the information she collected were size of business and whether or not the employer had provided AIDS education for employees. The following results were reported.

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May we conclude on the basis of these data that whether or not a business provides AIDS education is independent of the size of the business? Let  $\alpha = 0.05$

Number of Employees	AIDS education provided	
	Yes	No
0-50	2	20
50-500	5	11
More than 500	11	5

- (c) Define the following :
- 1) One and two tailed test
  - 2) Conditional Probability
  - 3) Mode
  - 4) Correlation and Regression

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5]

- (a) Sample variances were computed for the tidal volumes (milliliters) of two groups of patients suffering from atrial septal defect. The results and sample sizes were as follows:

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$$n_1=31, s_1^2 = 35000$$

$$n_2=41, s_2^2 = 20000$$

Construct the 95 percent confidence interval for the ratio of the two population variance

( Given :  $F_{0.975}(30,40) = 1.94$  and  $F_{0.25}(40,30) = 0.4975$  )

(b)

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Cardiac output (liters/minute) was measured by thermodilution in a simple random sample of 15 postcardiac surgical patients in the left lateral position. The results were as follows :

4.91 4.1 6.74 7.27 7.42 7.5 6.56 4.64  
5.98 3.14 3.23 5.8 6.17 5.39 5.77

Can we conclude on the basis of these data that the population mean is different from 5.05 ? Use 5 % LOS. Use Wilcoxon signed-rank test for location.

( Given :  $T_{0.05}(15) = 25$  )

- (c) The following table shows the number of hours 45 hospital patients slept following the administration of a certain anesthetic. 6

7	10	12	4	8	7	3	8	5
12	11	3	8	1	1	13	10	4
4	5	5	8	7	7	3	2	3
8	13	1	7	17	3	4	5	5
3	1	17	10	4	7	7	11	8

For these data construct a cumulative frequency distribution , a relative frequency distribution , a cumulative relative frequency distribution , a histogram and a frequency polygon.

- 6] (a) Suppose that over a period of several years the average number of deaths from a certain non contagious disease has been 10. If the number of deaths from those disease follows the Poisson distribution, what is the probability that during the current year 6

i) exactly seven people will die from the disease ?

ii) ten or more people will die from the disease ?

iii) there will be no death from the disease ?

- 6) Do urban and rural male junior high school students differ with respect to level of mental health? Use median test. 8

Urban	Rural	Urban	Rural
35	29	25	50
26	50	27	37
27	43	45	34
21	22	46	31
27	42	33	
38	47	26	
23	42	46	
25	32	41	

Test at the 0.05 level of significance, the null hypothesis that the median score for the population sampled is 100.

- c) Researchers wish to know if the data they have collected provide sufficient evidence to indicate a difference in the mean serum uric acid levels between normal individuals and individuals with Down's syndrome. The data consist of serum uric acid readings on 12 individuals with Down's syndrome and 15 normal individuals. 6

Sample	mean(mg/100ml)	variance
Down's syndrome	4.5	1
normal	3.4	1.5

- 7) (a) The table shows the corresponding values of three variables  $x$ ,  $y$ , and  $z$ . 10
- (a) Find the linear least-squares regression equation of  $z$  on  $x$  and  $y$ .
- (b) Estimate  $z$  when  $x = 10$  and  $y = 6$ .
- (c) Find :  $r_{12}$   $r_{13}$   $r_{23}$

$x$	3	5	6	8	12	14
$y$	16	10	7	4	3	2
$z$	90	72	54	42	30	12

- b) Nancy Stearns Burgess conducted a study to determine weight loss, body composition, body fat distribution, and resting metabolic rate in obese subjects before and after 12 weeks of treatment with a very-low-calorie diet (VLCD). The women's weights before and after the 12-week VLCD treatment are shown in the following table

10

We wish to know if these data provide sufficient evidence to allow us to conclude that the treatment is effective in causing weight reduction in obese women

B	117.3	111.4	98.6	104.3	105.4	100.4	81.7	89.5	78.2
A	83.3	85.9	75.8	82.9	82.3	77.7	62.7	69	63.9