

# UKA TARSADIA UNIVERSITY

030020205 - Biostatistics (THEORY) at the B.Pharm. (2nd Semester)

**Subject:** 030020205 – Biostatistics

**Duration:** 3 Hours

**Marks:** 70

## Instructions:

1. Attempt all questions.
2. Write each section in a separate answer book.
3. Make suitable assumptions wherever necessary.
4. Figures to the right indicate full marks.
5. Draw diagrams/figures whenever necessary.

## Section-1

**Q-1 (A) Do as directed:**

**[07]**

- I) Explain the term "Sampling".
- II) Define: Standard Error.
- III) Explain sign test with one example.
- IV) Define: Degree of freedom.
- V) Enlist types of diagrams.
- VI) What is one-tailed test?
- VII) What are the types of Hypothesis?

**Q-1 (B) Answer the following in brief: (Any Four)**

**[08]**

- I) A population consists of five numbers 2, 3, 6, 8, 11. Consider all possible size of two which can be drawn with replacement from this population. Calculate the standard error (S.E.) of sample mean.
- II) Write in brief rules for constructing diagrams.
- III) State advantages of non-parametric test.
- IV) The following are the average weekly losses of worker – hours due to accident in ten industrial plants before and after a certain safety was into operation.

Before	45	73	46	124	33	57	83	34	26	17
After	36	60	44	119	35	51	77	29	24	11

Use the sign test at the 0.05% level of significance to test whether the safety program is effective. (From table value = 0.9893)

- V) Differentiate between the sampling with replacement and without replacement.
- VI) The following table shows the result of an experiment to investigate the effect of vaccination induced on the animals against a particular disease. Use the Chi-square test to test the hypothesis that there is no difference between the vaccinated and unvaccinated groups i.e. vaccination and these diseases are independent.

	Got disease	Did not get disease
Vaccinated	9	47
Not -vaccinated	15	28

**Q-2 Answer the following:**

**[10]**

- A) A bioavailability study was conducted in which two products were compared (A and B formulations). The peak blood concentrations were as follows. Use Wilcoxon signed rank test

to determine if there is difference among formulations. (Critical value for T at P=0.02 for 12 pairs and 0.05 level of significance = 2.05).

Subject	1	2	3	4	5	6	7	8	9	10	11	12
A	2.5	3.0	1.25	1.75	3.5	2.5	1.75	2.25	3.5	2.5	2.0	3.5
B	3.5	4.0	2.5	2.0	3.5	4.0	1.5	2.5	3.0	3.0	3.5	4.0

OR

- A) The following data present that yields in quintals of common ten sub-divisions of equal area of two agriculture plots :

Plot -1	6.2	5.7	6.5	6.0	6.3	5.8	5.7	6.0	6.0	5.8
Plot-2	5.6	5.9	5.6	5.7	5.8	5.7	6.0	5.5	5.7	5.5

Test whether two samples taken from two random populations have the same variance. (5% point F for  $v_1=9$  and  $v_2=9$  is 3.18). Perform F-test.

- B) One thousand articles from a factory are examined and found to be 3% defective. 1500 similar articles from another factory are found to be 2% defective. Can it reasonably be concluded that the product of the first factory is inferior of the second? Evaluate using two difference mean.

OR

- B) Explain the uses of chi - square test.

**Q-3 Answer the following in detail. (Any 2)**

**[10]**

- A) Two types of drugs were used on 5 and 7 patients for reducing their weight. Drug A was imported and Drug B indigenous. The decrease in weight after using a drug for six months was as follows.

Drug A	10	12	13	11	14		
Drug B	8	9	12	14	15	10	9

Is there a significant difference in the efficacy of the two drugs? If not, which drug should you buy? (For  $v=10$ ,  $t_{0.05}=2.223$ ).

- B) Differentiate between parametric and non-parametric tests. Highlight the advantages of non-parametric tests in certain experimental situation with example.
- C) A clinical trial was carried out for evaluating the efficiency of capsule product containing a natural product in decreasing the weight of obese patient by one of the contract research organization. The body weights of 10 obese patients were observed before and after four weeks of clinical trials. The data are given in the table given.

Patient Number	Weight in Kilograms	
	Before the start of trial	After 4 weeks of the start
1	140	131
2	125	121
3	154	150
4	121	121
5	115	108
6	156	151
7	150	150
8	154	153
9	130	124
10	106	100

Using as appropriate statistical test, conclude whether or not the natural product was clinically successful. (Table value 1.83 at 5% level).

## Section-2

**Q-4 (A) Do as directed:**

**[07]**

- I) What is analysis of variance?
- II) Explain Quality Control chart.
- III) What are the properties of normal distribution.
- IV) Define: Regression coefficient.
- V) Explain Rank correlation.
- VI) Classify experimental designs.
- VII) Define : Sigma Chart .

**Q-4 (B) Answer the following in brief: (Any 4)**

**[08]**

- I) Explain the following terms :
  - a) Control chart for variables.
  - b) Control chart for attributes
- II) What are major assumptions of ANOVA?
- III) If the correlation coefficient between x and y is 0. And the covariance between them is 36 and variance of x is 16 then find the standard deviations of 'y'.
- IV) Give the properties of correlation coefficient.
- V) Obtain two regression coefficients for the following data.  
 $n = 15, \sum (x - \bar{x})^2 = 145, \sum (y - \bar{y})^2 = 105, \sum (x - \bar{x})(y - \bar{y}) = 115.$
- VI) Explain Gaussian and Non- Gaussian type of distribution.

**Q-5 Answer the following:**

**[10]**

- A) Find the regression equation showing the capacity utilization on production from the data:

	Average	Standard deviation
Production (in lakh units)	35.6	10.5
Capacity Utilization (in %)	84.8	8.5
Correlation coefficient	r=0.62	

Estimate the production when the capacity utilization is 70%.

**OR**

- A) What is crossover design? Discuss merits and demerits of the crossover design.
- B) Construct the R-chart from the following data and state your conclusions:

Sample no.	Observations			
1	20	22	25	24
2	18	23	20	26
3	24	25	22	20
4	23	21	26	24
5	24	25	24	21
6	20	22	23	25
7	18	23	22	26
8	23	20	25	25
9	20	22	26	24
10	19	22	24	23

N=4, A=1.5, A1=1.88, A2=0.729, C2=0.7979, D1=0, D2=4.698, D3=0, D4=2.282, d2=2.059

**OR**

- B) What is correlation? Distinguish between positive, Negative and zero correlation.

**Q-6 Answer the following(Any Two)****[10]**

- A)** A food company puts mango juice in two cans advertised as containing ounces of the juice. The weights of the juice drained from cans immediately after filling for 4 samples are taken by a random method. Each of the samples includes 3 cans. The samples are tabulated in the the following table. Evaluate using  $\bar{X}$ -chart.( $A_2=0.729$ )

Sample Number	Weight of each can (3 cans in each sample, n=3)		
	$\bar{X}$		
1	15	12	13
2	10	8	8
3	8	15	17
4	12	17	11

- B)** A pharmaceutical company wishes to test whether its three salesmen A, B and C tends to make sales of the same size or whether they differ in their selling ability as measured by the average size of their sales. The following are the weekly sales record of three salesmen.

A	B	C
20 units	50 units	60 units
30 units	20 units	20 units
20 units	20 units	30 units
40 units	30 units	50 units
30 units	40 units	50 units

Determine whether the average sales of three salesmen differ in size. Evaluate using One way ANOVA Classification.

- C)** Enumerate the experimental designs in clinical trials. Discuss in details about any one experimental design.