

**B. PHARMACY FOURTH YEAR SECOND SEMESTER EXAM 2024**  
**Course Name: BIostatistics AND RESEARCH METHODOLOGY**  
**Course Code: BP801T**

**Time: 3hours**

**Full Marks: 75**

*Answer any five questions taking at least one from each group*

**Group-A**

1. (a) What are data? Classify data in a tabular form. What are categorical data? Differentiate between nominal and ordinal data. Write about the different events of probability. [1+2+1+2+3 =9]

(b) Response feelings (in seconds) of an anti-inflammatory spray in 5 women and 4 men are depicted below.

Category	Response (in seconds)
Female	15
Female	23
Female	36
Female	21
Female	40
Male	27
Male	17
Male	29
Male	38

Using **Man-Whitney U-test**, calculate rank-sum values. If critical H-value = 0.183, ( $p=0.05$ ), find out test H-value and draw inference at the statistical level of significance of the data. [6]

2. (a) What do you mean by non-parametric data? Why is **the Kruskal-Wallis test** called non-parametric ANOVA? How is the test different from ANOVA of parametric data set? Define degree of freedom. [2+2+2+1= 7]

(b) Following are the like-response (in seconds) of females of three data sets. Using the Kruskal-Wallis non-parametric statistical analysis, determine the test H-value.

category	Response (seconds)	Response (seconds)	Response (seconds)
	Set 1	Set 2	Set 3
Female	28	33	23
Female	20	37	25
Female	12	26	34
Female	32	18	15

[8]

**Group-B**

3. a) Define with example of arithmetic mean, geometric mean, harmonic, median, and mode. b) Define and explain variance and standard deviation c) The normality of a solution of sodium hydroxide as determined by an 'analyst' by four different titrations are found to be 0.5038, 0.5049, 0.5042, and 0.5039. Calculate the mean, median, average deviation, standard deviation and coefficient of variation. [5+4+6=15]

4. a) Define factors and levels with example. b) What are full factorial design and fractional factorial design? c) Explain  $2^3$  factorial experiments. [4+4+7=15]

[ Turn over

## Group-C

5. Among 1000000 tablets in a batch, 50000 are containing specks of grease. What is the probability of chosen tablet with specks? 30000 have chipped edges and 40000 are discoloured. What is the probability of chosen defect tablet? If 20000 tablets are chipped and specked, what is the probability of specked or chipped tablet? [15]

Or

What are the importances of binomial distribution? The overall failure percentage in dissolution test is 40%. What is the probability that out of 6 tablets at least 4 pass the test? [15]

6. a. Calculate Karl-Pearson's coefficient of correlation from the dissolution data of two batches of tablets and interpret its value.

Time (h)	1	2	3	4	5	6	7
Dissolution (A)	100	200	300	400	500	600	700
Dissolution (B)	30	50	60	80	100	110	130

b. Find the regression line from the given data.  $X = 6, 2, 10, 4, 8$  and  $Y = 9, 11, 5, 8, 7$  [7.5×2=15]

Or

a. Define and classify hypothesis. What are four possible conditions may arise during test of hypothesis? Why type-II error is more dangerous than type-I error in the test of hypothesis? Define fiducial or confidence limits.

b. The dissolution of a sample of 16 tablets has 53 minutes as mean. The sum of square of variation taken from the mean is 135 minutes. Can this sample taken from a batch of mean 56 minutes? (At d.f. 15,  $t_{0.05}=1.753$ ) [8+7=15]

7. In an experiment of anti-inflammatory activity, four products of same plant were tested in three different seasons- summer, winter and monsoon. The results are given below. Examine the efficacy of the products on their make and season Draw the ANOVA table. (At d.f. 6&3,  $F_{0.05}=8.94$ ).

Season	Products			
	A	B	C	D
Summer	36	36	21	35
Winter	28	29	31	32
Monsoon	26	28	29	29

[15]

Or

Two products of a drug were tested on 5 and 7 patients for reducing body weight. Product A was imported and B was indigenous. The reduced weight after 6 months were A: 10, 12, 13, 11, 14 and B: 8, 9, 12, 14, 15, 10, 9. Examine the efficacy of the products and which product should buy? (At d.f. 10,  $t_{0.05}=2.22$ ). [15]