



22424-41075



Library
Pharmaceutical Technology
Brainware University
Baresat, Kolkata-700125

BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – B.Pharm-2021/B.Pharm-2022

Course Name – Biostatistics and Research Methodology - Theory

Course Code - BP801T

(Semester VIII)

Full Marks : 75

Time : 3:0 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 20=20

1. Choose the correct alternative from the following :

(i) Select the sum of frequencies for all classes in a frequency distribution.

a) 1

b) Total number of elements in the data

c) Number of classes

d) 100

(ii) Select the measure of location that is the most likely to be influenced by extreme values in the data set.

a) Range

b) Median

c) Mean

d) Mode

(iii) A scatter plot shows that all the data points fall in a straight line. Select the correct interpretation.

a) There is no relationship between the variables.

b) There is a linear relationship between the variables.

c) There is a non-linear relationship between the variables.

d) Nothing can be said about the relationship between the variables.

(iv) If two variables move in the same direction, then the correlation between them is said to be _____. Select the correct option.

a) Positive

b) Negative

c) Zero

d) None of these

(v) Select the mean of the binomial distribution with parameters n and p.

- Page 2 of 5

c) 6

d) 8

(xvi) In factorial designs, the term "interaction" refers to _____. Choose the correct answer.

a) The combined effect of two or more factors on the outcome

b) The effect of one factor alone

c) The need to test multiple factors

d) The effect of only one factor

(xvii) The Central Composite Design (CCD) includes axial points, which are used to _____. Choose the correct option.

a) Estimate the first-order effects

b) Estimate the curvature in the response surface

c) Test the final results of optimization

d) Determine the number of factors

(xviii) Choose the use of optimization techniques in RSM.

a) Minimize the number of experimental runs

b) Maximize the accuracy of the response prediction

c) Determine the optimal factor settings that yield the best response

d) Simplify the mathematical models used in experimentation

(xix) Choose the use of axial points in RSM.

a) Optimize the main effects

b) Estimate the curvature of the response surface

c) Analyse interaction effects between factors

d) Determine the centre of the design

(xx) Choose the use of Central Composite Design (CCD).

a) Analyse only linear effects

b) Model the quadratic behaviour of a system

c) Perform single-factor optimization

d) Eliminate the need for factorial design

Group-B

(Short Answer Type Questions)

5 x 7=35

2. Explain the meaning of plagiarism.

(5)

3. If the two lines of regression are given as $X + 2Y = 4$, $X + 3Y = 5$, estimate the means of X and Y.

(5)

4. A pharmacy tracks the number of units of a painkiller sold over 5 days: 12, 15, 18, 12, 20. State the mean, median and mode of the number of units sold.

(5)

5. The mean monthly sale of a particular household item in department stores was observed as 133.3 units per store. After an advertising campaign, data on sales of this item from 25 stores were collected, and it is found that the mean sales have increased to 141.5 units with a standard deviation of 15.2 units. Assume that level of significance is 5%. Test if the advertising campaign was successful. Given: $t_{0.05,24} = 1.708$.

(5)

6. Illustrate the one-way ANOVA table at 5% level of significance to test if null hypothesis is correct. The following data is given:
Total sum of squares TSS= 1835.39
Treatment sum of squares SST=278.54
N=20, k=5.

(5)

7. In a pharmaceutical experiment, we want to optimize the dissolution rate of a drug tablet based on two factors. The results obtained are as follows:

(5)

Factor A (Compression Factor)	A ₁ (Low)	A ₁ (Low)	A ₂ (High)	A ₂ (High)
Factor B (Excipient)	B ₁ (Lactose)	B ₂ (Starch)	B ₁ (Lactose)	B ₂ (Starch)
Dissolution Rate (Response)	20	30	40	50

Write a suitable polynomial equation for a 2^2 factorial design using optimization techniques and write down the set of equations that will give the values of the coefficients.

OR

Write some pharmaceutical applications of Response Surface Methodology.

(5)

8. If k=5 and the number of levels is 3 for each of the factors, infer the total number of experiments to be performed in a full factorial design.

(5)

OR

Write the procedure for performing survival analysis in R using data from clinical trials.

(5)

Library
Pharmaceutical Technology
Brainware University
Barasat, Kolkata-700125

Group-C

(Long Answer Type Questions)

10 x 2=20

9. Illustrate cohort studies, observational studies and experimental studies using pharmaceutical examples.

(10)

10. Write a short note on Response Surface methodology and Response Surface Plots.

(10)

OR

Write the value of test statistic t for testing of hypothesis for the intercept A in simple linear regression $y=a+bX$, mentioning the null and the alternative hypothesis. Given:

(10)

$$\sum(X - \bar{X})^2 = 2000, \sum(y - \bar{y})^2 = 1698.75, \bar{X} = 90, a = 5.9, b = 0.915, N = 4.$$

Library
Pharmaceutical Technology
Brainware University
Barasat, Kolkata-700125