



EVEN

## Back/Debarred End Term (Odd) Semester Examination, January 2025

Roll no.....

Name of the Course and semester: Bachelor of Pharmacy & VIII<sup>th</sup> Semester

Name of the Paper: Biostatistics and Research Methodology (Theory)

Paper Code: BP801T

Time: 3hour

Maximum Marks: 75

**Note:**

- (i) This question paper contains three sections
- (ii) All the sections are compulsory in Section A
- (iii) Attempt all questions in Section A (Each question carries 1 Marks), any Seven questions in Sections B (Each question carries 5 Marks) & in Section C attempt any two questions (Each question carries 10 Marks)

### Section-A

#### Multiple Choice Question

20 X 1 = 20 MARKS

#### QUESTIONS

1. In biostatistics, frequency distribution is used to: (CO-1)
  - a) Summarize data
  - b) Identify the mode
  - c) Measure variability
  - d) All the above
2. Karl Pearson's coefficient of correlation ranges between: (CO-1)
  - a) 0 and 1
  - b) -1 and 1
  - c)  $-\infty$  and  $\infty$
  - d) -0.5 and 0.5
3. A pharmaceutical company finds the mode of the sales data to be 50. This indicates: (CO-1)
  - a) The average sales value is 50
  - b) 50 is the most frequently occurring sales value
  - c) 50 is the range of the sales data
  - d) The sum of all sales is 50
4. The process of collecting, analyzing, and summarizing numerical data in pharmaceutical studies is called: (CO-1)
  - a) Epidemiology
  - b) Biostatistics
  - c) Pharmacokinetics
  - d) Data mining
5. The equation  $y=a+bx$  (CO-2)  
 $y=a+bx$  is used to represent:
  - a) Exponential growth

- b) A straight-line relationship
  - c) Binomial distribution
  - d) Poisson distribution
6. Which test is used to compare the means of two groups in a paired sample? (CO-2)
- a) ANOVA
  - b) Pooled t-test
  - c) Paired t-test
  - d) One-way ANOVA
7. Which type of sampling involves selecting participants entirely by chance? (CO-2)
- a) Stratified sampling
  - b) Systematic sampling
  - c) Random sampling
  - d) Convenience sampling
8. What type of error occurs when a true null hypothesis is rejected? (CO-2)
- a) Type I error
  - b) Type II error
  - c) Sampling error
  - d) Standard error
9. The Friedman test is best suited for: (CO-3)
- a) Comparing independent groups
  - b) Comparing related samples
  - c) Testing correlation between variables
  - d) Evaluating data normality
10. Which graph is ideal for showing the proportion of categories in a dataset? (CO-3)
- a) Histogram
  - b) Pie Chart
  - c) Line Graph
  - d) Scatter Plot
11. Which type of study involves observing participants without interference? (CO-3)
- a) Experimental study
  - b) Cohort study
  - c) Observational study
  - d) Clinical trial
12. Clinical trials are typically conducted in: (CO-3)
- a) One phase
  - b) Two phases
  - c) Three or more phases
  - d) Without phases
13. Blocking is primarily used in experiments to: (CO-4)
- a) Introduce variability
  - b) Control for known nuisance factors
  - c) Increase interaction effects
  - d) Test main effects more effectively
14. The goodness-of-fit for a regression model is typically measured by: (CO-4)
- a) Regression coefficients
  - b) Standard deviation
  - c) R-squared value
  - d) p-value of the t-test
15. Which statistical software is best suited for regression modeling in industrial and clinical trials? (CO-4)

- a) SPSS
  - b) Excel
  - c) R
  - d) All of the above
16. Statistical significance in hypothesis testing is determined using: (CO-4)
- a) Standard error
  - b) p-value
  - c) Confidence interval
  - d) All of the above
17. In a  $2^3$  factorial design, how many experimental runs are required? (CO-5)
- a) 3
  - b) 4
  - c) 6
  - d) 8
18. Which of the following is a feature of historical design in RSM? (CO-5)
- a) Uses only new experimental data
  - b) Relies on previously collected data
  - c) Requires a balanced factorial setup
  - d) Is limited to linear responses
19. Optimization techniques in experimental design aim to: (CO-5)
- a) Reduce the number of factors
  - b) Identify the best set of conditions for a response
  - c) Eliminate response variability
  - d) Analyze only one variable at a time
20. How many degrees of freedom are available for the main effects in a  $2^2$  factorial design? (CO-5)
- a) 1
  - b) 2
  - c) 3
  - d) 4

### Section B

**Short Questions: Attempt any seven questions.**

**7x5 = 35 marks**

1. Discuss the importance of measures of central tendency in pharmaceutical quality control? (CO 1)
2. Calculate the range and standard deviation for the following data: drug concentrations of 20mg, 22mg, 25mg, 24mg, and 23mg? Calculate the mean and median for the following data on drug efficacy rates: 75%, 80%, 85%, 90%, and 95%? (CO 1)
3. Differentiate between Binomial, Normal, and Poisson distributions with one pharmaceutical application for each? (CO 2)
4. Compare one-way and two-way ANOVA with examples from clinical trials. Define the Standard Error of Mean (SEM)? (CO 2)
5. Explain the difference between cohort studies and observational studies with examples? (CO 3)
6. Explain the importance of designing experiments in research? What is plagiarism, and how can it be avoided in research? (CO 3)

7. Why is randomization important in clinical trials? What are the key features of SPSS for analyzing clinical trial data? (CO 4)
8. Draw the flowchart outlines the steps of a clinical trial and then Identify where statistical methods like hypothesis testing and regression analysis are applied. Explain their purpose at each step? (CO 4)
9. Explain the purpose and structure of a Central Composite Design (CCD). How do Central Composite Designs contribute to this Response Surface Methodology. Provide a practical example? (CO 5)

### Section C

**Long questions: Attempt any two questions**

**2x10 = 20 marks**

1. Discuss the role of statistics and biostatistics in pharmaceutical research, focusing on how frequency distribution, measures of central tendency (mean, median, mode), and measures of dispersion (range, standard deviation) are used in analyzing pharmaceutical data? (CO 1)
2. Explain the need for research and the role of experimental design in pharmaceutical studies. Discuss the importance of the Standard Error of Mean (SEM) in clinical trials and how it is used to interpret drug dosage studies? (CO 2/3)
3. Explain the concept of blocking and how it helps to control variability in a two-level factorial design. Explain the significance of statistical software such as Excel, SPSS, MINITAB®, and R Online in analyzing g data from industrial and clinical trials? (CO4/5)