

Reg. No. :

Code No. : 7690

Sub. Code : WMBSE 41

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2025.

Fourth Semester

Microbiology – Core

Skill Enhancement Course – RESEARCH
METHODOLOGY AND BIostatISTICS

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (15 × 1 = 15 marks)

Answer ALL questions.

Choose the correct answer :

1. What is the main purpose of research methodology?—
 - (a) To define the steps for completing a research project
 - (b) To collect data from different sources
 - (c) To analyze and evaluate the research findings
 - (d) To understand the principles and techniques applied in research

2. Which type of research focuses on exploring new ideas without the need for immediate practical application?
- (a) Applied research
 - (b) Exploratory research
 - (c) Descriptive research
 - (d) Basic research
3. Which technique involves collecting data through direct interaction with participants?
- (a) Surveys
 - (b) Content analysis
 - (c) Interviews
 - (d) Document review
4. Which of the following best defines a sampling frame?
- (a) A subset of a population chosen to represent the entire group
 - (b) A list of elements from which a sample is actually drawn
 - (c) The process of selecting a representative group from a population
 - (d) A type of non-probability sampling technique

5. Which of the following is true about ordinal variables?
- (a) They have no inherent order, and the values represent categories
 - (b) They have a meaningful order, but the intervals between values are not equal
 - (c) They have equal intervals between values and represent exact quantities
 - (d) They cannot be ranked in any meaningful way
6. What is the purpose of the appendices section in a research report?
- (a) To include detailed information such as raw data, questionnaires, or additional references that are supplementary to the report
 - (b) To summarize the findings of the research
 - (c) To present the conclusion and recommendations of the study
 - (d) To list the ethical considerations in the research process

7. The sum of squared deviations from the mean, divided by the number of observations, is known as:
- (a) Standard deviation
 - (b) Mean deviation
 - (c) Variance
 - (d) Median
8. Which of the following is a graphical method for displaying the relationship between two quantitative variables?
- (a) Frequency table
 - (b) Histogram
 - (c) Bubble spot
 - (d) Bar chart
9. If a dataset has a low standard deviation, it means:
- (a) The values are widely spread out
 - (b) The values are very close to the mean
 - (c) The mean is inaccurate
 - (d) The dataset is not skewed
10. Which of the following statements about Karl Pearson's coefficient of correlation (r) is true?
- (a) It ranges from -2 to +2
 - (b) It ranges from -1 to +1
 - (c) It always gives positive values
 - (d) It is used for non-linear relationships

11. In the regression equation $y = a + bx$, what does 'b' represent?
- (a) Intercept
 - (b) Slope or regression coefficient
 - (c) Constant value
 - (d) Predicted value of y
12. ANOVA (Analysis of Variance) is used to:
- (a) Compare the means of two groups
 - (b) Compare the means of three or more groups
 - (c) Analyze the variance within a single dataset
 - (d) Test the relationship between two categorical variables
13. In a probability distribution, the sum of all probabilities must be equal to:
- (a) 0
 - (b) 1
 - (c) 2
 - (d) Any positive value

14. Which probability distribution is used to model the number of successes in a fixed number of independent Bernoulli trials?
- Binomial distribution
 - Poisson distribution
 - Normal distribution
 - Exponential distribution
15. Which command in *R* is used to create a linear regression model?
- lm()
 - reg()
 - rlm()
 - glm()

PART B — (5 × 4 = 20 marks)

Answer ALL questions, by choosing either (a) or (b).
Each answer should not exceed 250 words.

16. (a) What are the key constraints in research, and how do they affect the research process?
- Or
- (b) What are the main types of research, and what are their characteristics?

Page 6 Code No. : 7690

17. (a) Differentiate between simple random sampling and systematic sampling.

Or

- (b) What are the key elements of a research report format?

18. (a) Describe the difference between standard deviation and variance. How are they related?

Or

- (b) What is a frequency table? Construct a simple frequency table for a single discrete variable.

19. (a) Explain the difference between positive and negative correlation with examples.

Or

- (b) You have data on the scores of students from three different groups:

Group A: 56, 67, 49

Group B: 72, 75, 70

Group C: 61, 65, 58

Task:

Calculate the F-statistic for one-way ANOVA.

Based on the calculated F-value, determine whether there is a significant difference in the means of the three groups.

Page 7 Code No. : 7690

20. (a) Explain the difference between discrete and continuous probability distributions.

Or

- (b) What is the normal distribution, and why is it important in statistics? Mention two real-world examples where it is used.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, by choosing either (a) or (b)
Each answer should not exceed 600 words.

21. (a) Explain the methods and techniques of primary data collection. Provide examples for each.

Or

- (b) What is a problem statement in research? Discuss its components and significance.

22. (a) Define sampling and explain the different types of sampling techniques.

Or

- (b) Discuss the importance of understanding variables in research. How do different types of variables impact the choice of research design and data analysis?

23. (a) Describe the three primary measures of central tendency: mean, median, and mode. Compare their advantages and disadvantages.

Or

- (b) What is a bubble sport chart, and how is it used to represent relationships between three variables?

24. (a) Discuss the difference between simple linear regression and multiple linear regression.

Or

- (b) Calculate the unknown variable using a simple linear regression equation:

You are given the regression equation:

$$y = 5 + 2x$$

- Calculate the value of y when $x = 10$.
- Interpret the meaning of the coefficients in the regression equation (5 and 2).

25. (a) Describe the process of bootstrapping and its application in estimating the sampling distribution of a statistic.

Or

- (b) Discuss the use of logistic regression for binary classification problems. How does logistic regression differ from linear regression, and what are its assumptions?
-