Behavioural Research and Experiment Design
Quiz 1

Time: 45 minutes
Total Marks: 20

Section A [3 marks]

For each of the hypotheses given below, indicate if it is directional or non-directional and frame the appropriate null hypothesis. Each question carries 1 mark.

A. Watching anime has no effect on creativity
B. Listening to Jazz music will influence stress levels.
C. Eating White sauce pasta improves cognition

Section B [5 marks]

For each of the following multiple-choice questions (MCQs), select the one correct answer. Each question carries 1 mark. (You can provide explanations for your answers where you think the options may seem ambiguous for us to consider.) (Answer any 5 questions)

1. What information can be inferred if a study is represented by a 3×2×4 factorial design?

a. The design has 2 independent variables with 3 main effects possible.
b. The design has 3 independent variables with 3 two-way interactions possible.
c. The design has 3 independent variables with 6 two-way interactions possible.
d. The design has 9 independent variables with 3 two-way interactions possible.

2. A researcher wants to survey students in a city.

In Method A, the researcher divides the students by school level (elementary, middle, high school) and randomly selects a proportionate number of students from each level.
In Method B, the researcher randomly selects a few schools from the city and surveys all students in those selected schools.
Which of the following best describes Method A and Method B?

a. Method A is cluster sampling, and Method B is stratified sampling
b. Method A is simple random sampling, and Method B is stratified sampling

c. Method A is stratified sampling, and Method B is cluster sampling
d. Both Method A and Method B are forms of systematic sampling

3. Any relationship between the two variables under study, according to the _____, is the result of chance.

a. Alternative Hypothesis
b. Directional Alternative Hypothesis
c. Null Hypothesis
d. Non Directional Hypothesis
e. None of the above

4. A diagnostic test has high sensitivity but low specificity. Which statement correctly describes the test?

a. Most people with the disease are correctly identified, but many healthy people are incorrectly labeled as diseased.
b. Most people with the disease are correctly identified, and most healthy people are correctly identified.
c. Many people with the disease are missed, but most healthy people are correctly identified.
d. Many people with the disease are missed, and many healthy people are incorrectly labeled as diseased.

5. A diagnostic test is performed on a group of people. Which of the following statements is Incorrect?

a) False positive occurs when a healthy person is incorrectly identified as having the disease.
b) False negative occurs when a diseased person is incorrectly identified as healthy.
c) Sensitivity measures the ability of a test to correctly identify diseased people.
d) Specificity measures the ability of a test to correctly identify healthy people.
e) All the Above Statements are Correct

6. A study investigates the effects of chemotherapy on the size of cancerous tumours in a sample of 100 patients over a 2-year period, with measurements taken at regular intervals. The objective is to generalise the findings to a larger population. This is an example of

a. Longitudinal design
b. Cross-Sectional design
c. Case study design
d. None of these designs

Section C [2 marks]

Operationalise the following conceptual variables. Each question carries 1 mark.

1. A study is being conducted to explore the effect of social media usage on teenagers' self-esteem.

How would you operationalize the variable "**social media usage**" in this context?

2. Context: A study is being conducted to investigate how team composition influences match outcomes in the IPL.

How would you operationalize the variable " **team composition** " in this context?

Section D [5 marks]

1. Arjun recently conducted a study that uses a 2×2 factorial design. He used independent variables as Diet Type (Vegetarian, Non-Vegetarian) and Exercise Level (Low, High), and a dependent variable i.e. the stamina score obtained in a fitness test.

Based on the study he plotted a graph, and found that:

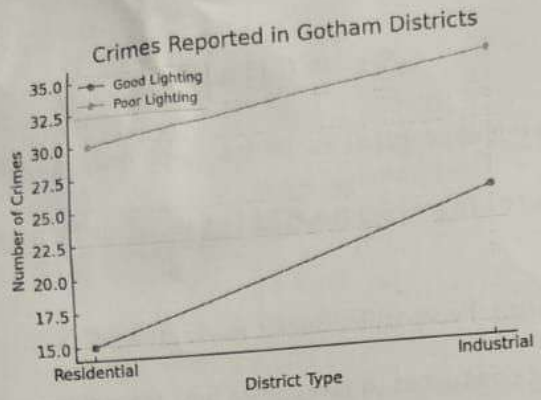
- Independent variable Exercise Level had a main effect.
- Independent variable Diet Type did not have any main effect.
- There was an interaction between these two independent variables.

a) Consider Exercise Level to be on the X-axis and plot a graph to demonstrate the above results. [1M]

2. A researcher in Gotham is conducting a 2×2 factorial design study with the following variables:

- Independent Variables: District type (Residential vs. Industrial) and Street lighting (Good vs. Poor)
- Dependent Variable: Number of crimes reported.

The number of crimes for each district type and street lighting condition are plotted in the line graph shown below.



Answer the following questions:

1. Does the independent variable street lighting have a main effect? (Yes/No) [0.5M]
2. Does the independent variable district type have a main effect? (Yes/No) [0.5M]
3. Is there an interaction effect between street lighting and district type? Explain [1M]

3. Based on the Statements Identify type of Extraneous variable that is causing the error (Random, Constant or Confounding) and justify.

a) A weighing machine always shows 5 grams more than the actual weight, no matter what object is placed on it. [1M]

b) Five students time the oscillations of the same pendulum using stopwatches. Each gets slightly different values [1M]

Section E [5 marks]

1. A coaching institute is testing the effectiveness of a new online teaching method designed to improve students' JEE Mains scores. The institute recruits 200 students preparing for JEE Mains and randomly assigns them to two groups.

- Group 1 receives the new online teaching method.
- Group 2 follows the traditional classroom teaching method.

Both groups are taught for six months. Throughout the study, the students' progress is monitored with weekly mock tests. The institute then compares the average improvement in JEE Mains mock test scores between the two groups to determine if the new method is more effective than the traditional one.

Answer the following questions:

A. Identify the independent and dependent variables used in this study. [1M]

B. Is this a 'within-subjects' or a 'between-subjects' study? Justify your answer. [1M]

C. State at least two potential extraneous variables in this study. How would you control these variables? [1M]

D. What type of an experiment is this? Justify your answer. [1M]

E. What Type of Sampling is used in this experiment? Justify [1M]