00005

THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF PSYCHOLOGY & COUNSELLING
ACADEMIC YEAR 2024/2025– SEMESTER I

BSC HONS IN PSYCHOLOGY
PLU5305 – ADVANCED RESEARCH METHODS AND STATISTICS IN PSYCHOLOGY - LEVEL 5
CONTINOUS ASSESSMENT TEST – NBT I
DURATION: 1 ½ HOURS

DATE: 16th January 2025   TIME: 2.00 PM – 3.30 PM

INDEX NO: ....

IMPORTANT INSTRUCTIONS/ INFORMATION TO CANDIDATES

- This question paper consists of **12 pages** with **TWO sections**

  Section 1: 20 Multiple Choice Questions - (40 Marks)

  Section 2: 12 Short Answer Questions - (60 Marks)

- Write your INDEX number in the space provided.

- **Multiple Choice Questions (Section 1):** Indicate answers in the **ANSWER SHEET** provided by placing a cross **(X)** in **INK** in the relevant cage (answers in pencil will **NOT** be marked)

- **Short Answer Questions (Section 2):** Write the answer within the space provided.

- Do **NOT** remove any page/part of this question paper from the examination hall.

- Do **NOT** keep unauthorized materials, including mobile phones and other electronic equipment, with you during the examination.

- **Non-Programmable** calculators are allowed.

SECTION 1: Multiple Choice Questions (20 Questions-40 Marks)

1.1 A psychologist wants to understand how patients with depression react to different treatments. What is the primary goal of scientific research in psychology?

    a   To make broad generalizations
    b   To describe, predict, and explain behaviour
    c   To prove theories
    d   To conduct experiments

1.2 In a study examining the impact of stress on cognitive performance, stress level is measured as a variable, allowing the researcher to explore how different levels of stress influence performance. What is a variable in the context of scientific research?

    a   A method of data analysis
    b   A constant factor in an experiment
    c   An attribute or characteristic that can be measured or counted
    d   A formula used for hypothesis testing

1.3 An investigator examines the relationship between height and academic performance, participants' heights are measured in centimetres. What type of variable is "Height" considered to be?

    a   Continuous
    b   Ordinal
    c   Nominal
    d   Discrete

1.4 A researcher studies the relationship between exercise and mental health with social support explain how exercise influences mental health. Which variable explains the relationship between the exercise and mental health?

    a   Control variable
    b   Moderator variable
    c   Mediator variable
    d   Confounding variable

1.5 In a study examining the relationship between smoking and lung cancer, the failure to account for air pollution as a confounding variable could lead to inaccurate conclusions about the direct effect of smoking. Which of the following is a potential problem when confounding variables are not controlled?

    a   Increased sample size
    b   False associations between the independent and dependent variables
    c   Greater reliability in results
    d   Improved internal validity

1.6   A researcher conducts a study to explore the underlying neural mechanisms of decision-making, aiming to contribute to a deeper understanding of cognitive psychology. Which of the following research types seeks to expand existing knowledge?

    a   Applied research
    b   Qualitative research
    c   Quantitative research
    d   Basic research

1.7   A psychologist conducts a study to find out which treatment for anxiety works best in reducing symptoms in patients, with the goal of recommending practical interventions. Which of the following is an example of applied research?

    a   Studying how memory works in children
    b   Examining the causes of depression
    c   Testing a new treatment for anxiety
    d   Exploring the effects of sleep deprivation on cognitive function

1.8   In a study on how individuals cope with grief, the researcher collects detailed interviews and uses thematic analysis to understand participants' personal experiences. Which of the following is true about qualitative research?

    a   It primarily uses statistical techniques to analyse data
    b   It aims to gather unfiltered data from a large sample
    c   It uses numerical data and focuses on generalizability
    d   It is concerned with understanding detailed experiences of participants

1.9   First Year students study the relationship between socioeconomic status and academic achievement, finding that the effect is stronger for older students. Age acts as a moderator variable. Which of the following best describes the purpose of the moderator variable in research?

    a   To explain the relationship between the independent and dependent variables
    b   To change the direction or strength of the relationship between the independent and dependent variables
    c   To control extraneous variables
    d   To manipulate the independent variable

1.10   A marketing team analyses the relationship between the number of social media posts and the website traffic. Which Pearson correlation coefficient indicates a strong positive correlation between two variables?

    a $r = 0.95$
    b $r = 0.2$
    c $r = -0.85$
    d $r = 0.5$

1.11   A study finds that the number of people buying umbrellas increases alongside the number of shark attacks. Which of the following best describes a spurious correlation?

    a   A correlation that is not supported by data

    b   A correlation that is caused by a third, hidden variable

    c   A perfect correlation between two variables

    d   A correlation that has an equal positive and negative relationship

1.12   A business tracks its monthly sales revenue in response to different advertising budgets. In the context of the study on advertising spending and sales revenue, what is the dependent variable?

    a   Advertising spending

    b   Sales revenue

    c   The months of data

    d   The correlation coefficient

1.13   A company builds a model to predict employee satisfaction based on salary, work-life balance, and office environment. The model has an R^2 value of 0.85, meaning 85% of the variation in employee satisfaction is explained by the predictors. What does a higher R^2 value indicate in regression analysis?

    a   The model explains a lower proportion of the variability

    b   The model does not fit the data well

    c   The model explains a higher proportion of the variability

    d   The independent variable has no effect on the dependent variable

1.14   Before running a linear regression on the relationship between advertising expenditure and sales revenue, a marketing analyst checks if the residuals of the model are satisfying the assumptions. Which of the following assumptions of linear regression ensures that the residuals (errors) have constant variance?

    a   Normality of errors

    b   Linearity

    c   Homoscedasticity

    d   Independence of errors

1.15   A company is studying how multiple factors, including years of experience, education, and work hours, affect employee productivity. Which type of regression involves more than one independent variable?

    a   Simple linear regression

    b   Multiple linear regression

    c   Polynomial regression

    d   Logistic regression

1.16 Regression analysis is widely used in various fields, such as economics, business, healthcare, and social sciences, to make predictions and inform decision-making. Which of the following is an example of a real-world scenario where regression analysis can be applied?

    a   Examining the relationship between advertising expenditure and sales

    b   Correlating the temperature with ice cream sales

    c   Analysing the number of hours studied and exam scores

    d   All the above

1.17 A regression model predicting customer satisfaction based on product quality and customer service has an R^2 value of 0.75. What does this indicate?

    a   The model explains 75% of the variation in the dependent variable

    b   The model is not useful

    c   The dependent variable is 75% accurate

    d   The model predicts the dependent variable with 75% precision

1.18 A real estate agency predicts house prices using size and age as predictors. However, if size and age are highly correlated, the model might face issues. What is the key assumption behind no multicollinearity in multiple regressions?

    a   Residuals should be normally distributed

    b   Predictors should not be strongly correlated

    c   Errors should be independent

    d   Variance of residuals should be constant

1.19 A fitness researcher observes that taller individuals tend to weigh more but wants to quantify how strongly height and weight are related. What does this indicate?
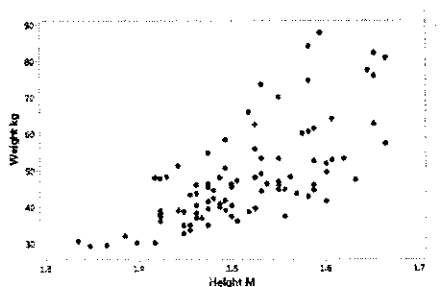
    a   No correlation

    b   Weak negative correlation

    c   Positive correlation

    d   Strong negative correlation

1.20   A sales manager finds that forecasting sales is difficult because errors in one month are influenced by errors in the previous month. This violates a key assumption of linear regression. What happens if errors are not independent in regression analysis?

    a   Predictions might be invalid

    b   Regression estimates are efficient

    c   Regression estimates remain unbiased

    d   It doesn't affect the model

INDEX NO: ....

ANSWER SHEET FOR SECTION-1

Q. No.	(a)	(b)	(c)	(d)
1.1				
1.2				
1.3				
1.4				
1.5				
1.6				
1.7				
1.8				
1.9				
1.10				
1.11				
1.12				
1.13				
1.14				
1.15				
1.16				
1.17				
1.18				
1.19				
1.20				

INDEX NO: ....

SECTION 2: SHORT ANSWER QUESTIONS (60 MARKS)

All Questions are compulsory.

Consider the following scenario: You are conducting a study to examine the relationship between the number of hours spent watching TV per week (X) and the number of hours of sleep per night (Y) for individuals.

X: [15, 20, 25, 30, 35]

Y: [8, 6, 5, 6, 5]

2.1   Calculate the mean number of hours spent exercising per week by individuals.   **(Marks 03)**

2.2   Calculate the average number of calories burned during exercise sessions by the same individuals.   **(Marks 03)**

2.3   Complete the following table   **(Marks 10)**

x	y	$(x-\bar{x})(y-\bar{y})$	$(x-\bar{x})^2$	$(y-\bar{y})^2$
15	7			
20	6			
25	5			
30	8			
35	5			

2.4   Calculate the Pearson Correlation Coefficient.   **(Marks 06)**

2.5   Interpret the relationship between the number of hours spent watching TV per week and the number of hours of sleep per night for individuals.   **(Marks 02)**

A psychologist is interested in studying the impact of social media usage on the mental well-being of teenagers. The psychologist collects data from a group of teenagers, measuring the number of hours they spend on social media each day and their mental well-being score, which is assessed using a standardized psychological test (higher scores indicate better mental well-being). The collected data is as follows:

Hours of Social Media Use	Mental Well-Being Score
6	85
7	82
8	80
9	73
10	70

2.6   Identify the dependent and independent Variables   **(Marks 04)**

2.7   Calculate the mean number of Hours of Social Media Use and Mental Well-Being Score.

(Marks 04)

2.8   Calculate the S_{XY} value.   **(Marks 06)**

2.9   Calculate the S_{XX} value.   **(Marks 06)**

2.10 Calculate the slope and intercept for the simple linear regression model using the least squares method. **(Marks 06)**

2.11 Write the Simple Linear Regression model. **(Marks 04)**

2.12 Calculate the Mental Well-Being Score if an individual uses social media for 11 hours.

(Marks 06)

LIST OF EQUATIONS

$$r_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

$$Slope \quad a = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sum(x_i - \bar{x})^2}$$

$$int\,ercept \quad b = \bar{y} - a\bar{x}$$

-------------------------------------END OF QUESTION PAPER-------------------------------------