FAR WESTERN UNIVERSITY
FACULTY OF MANAGEMENT
MPhil/MPhil Leading to PhD Program in Management
Semester End Examination - 2025

FM: 100
Time: 4 Hrs.

Level: MPhil Semester: First Subject: Statistical Methods and Data Analysis

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Candidates are required to give original, insightful and analytical answers in their own words as far as practicable.

Group A: Attempt any SEVEN questions (7 × 10 = 70)

1. A company conducted an annual performance appraisal using a 10-point rating scale. The following scores were obtained from 20 employees: 7, 8, 6, 9, 7, 8, 7, 9, 8, 6, 9, 7, 10, 8, 7, 9, 6, 8, 7, 9. Compute the mean, standard deviation, and coefficient of variation and Interpret these values.
2. In a call center, 40% of calls are for technical support, 35% for billing, and 25% for general inquiries.The probability that a customer's issue is resolved on the first call is 0.8 for technical, 0.6 for billing, and 0.7 for general inquiries. a) What is the probability that a randomly selected call is **resolved**? b) If a call is resolved, what is the probability it was a **billing issue**?
3. The production cost per unit in a factory follows a normal distribution with a mean of NPR 500 and a standard deviation of NPR 40. a) What percentage of units cost less than NPR 460? b) What percentage of units cost between NPR 480 and 520? c) Determine the cost threshold above which only 5% of units fall.
4. A company surveyed 125 employees to assess job satisfaction across departments:

Department =>	Satisfied	Neutral	Dissatisfied
HR	18	9	8
Marketing	20	10	11
Finance	25	10	14

   At a 5% significance level, test whether **job satisfaction is independent of department**.
5. The HR department claims that a new training program improves employees' productivity. Before the training, the average output was 52 units per day. After training, a random sample of 30 employees showed a mean output of 55 units with a standard deviation of 6. At a 5% significance level, test whether the training has significantly increased productivity.
6. A marketing analyst found that 120 out of 200 customers remained loyal after a promotional campaign. a) Construct a 95% confidence interval for the true proportion of loyal customers. b) What sample size would be required to estimate this proportion with a 3% margin of error and 95% confidence?
7. The marketing manager analyzed the relationship between **advertising expenditure (in thousands)** and **monthly sales revenue (in lakhs)** using data from 10 months.
   The regression output was as follows:
   Sales=25+4.2(Advertising), r^2=0.91
   a) Interpret the **slope** and **intercept** in a managerial context.
   b) Predict the sales when advertising expenditure is NPR 6,000.
   c) What percentage of variation in sales is explained by advertising?

8. A company compared employee motivation scores (out of 100) under three leadership styles:

Transformational	82	85	84	83	87	81
Transactional	75	78	74	76	77	73
Laissez-faire	68	70	65	72	69	68

   The following calculation has been done: sum of squares between leadership styles is 676.8 and total sum of squares is 745. On the basis of these data, and at 5% level of significance, perform a **one-way ANOVA** to test if there are differences in average motivation across leadership styles.

9. A company analyzed data from 15 departments to understand factors influencing employee turnover (%). The variables were: X1: Average working hours per week, X2: Job satisfaction score, Y: Turnover rate (%)
   Regression output:
   $Y=18 - 0.4\ X_2+0.3\ X_1$, $R^2=0.72$ and Additional statistics:
   Total Sum of Squares (SST) = 250
   Residual Sum of Squares (SSR) = 70
   a) Interpret the coefficients of both predictors.
   b) What does the R^2 value tell you about the model?
   c) Compute the F-statistic for overall model significance and test if the regression model is statistically significant.

10. You are asked to conduct a nationwide survey on consumer confidence for an economic forecasting study. Discuss whether you would use stratified, systematic, or cluster sampling and justify your choice.Explain how you would ensure representativeness across provinces and income groups.

Group B: Practical using SPSS, Attempt any TWO questions (2 × 15 = 30)

11. A company sells 100 different consumer products and wants to understand how product quality, marketing expenditure, and launch duration affect total units sold. The dataset `sales.sav` contains information on:

Variable	Description
Sales_Units	Number of product units sold in the first year
Product_Rating	Average customer rating (1–5 scale)
Marketing_Spend	Marketing expenditure (in Rs. thousands)
Launch_Duration	Time since product launch (months)
Product_Category	Category of the product (Electronics, Clothing, Cosmetics, Household, Food)

Perform multiple linear regression analysis using sales_Units as the dependent variable and Product_Rating, Marketing_Spend, and Launch_Duration as predictors.
Report regression coefficients, t-values, p-values, R^2, SE of Estimate and ANOVA table.
Interpret which variables significantly affect sales. Examine the Variance Inflation Factor (VIF) for each predictor and interpret it.

12. A dataset named behavior.sav contains responses from 150 consumers collected during a national survey on purchasing habits and lifestyle patterns. The variables in the dataset are:

Variable	Description
Monthly_Expenditure	Average monthly spending on consumer goods (in Rs. thousands)
Brand_Loyalty	Level of loyalty toward specific brands (1 = Very Low, 5 = Very High)
Social_Influence	Influence of friends, family, social media on purchase decisions (1–5)
Online_Shopping_Freq	Number of online purchases made per month
Buyer_Status	Categorized as “Buyer” or “Non-Buyer” based on regular purchase activity

Perform a Discriminant Analysis to classify individuals as Buyers or Non-Buyers using the predictors: Monthly_Expenditure, Brand_Loyalty, Social_Influence, and Online_Shopping_Frequency. Obtain the discriminant function coefficients and Wilks’ Lambda. Interpret whether the discriminant function significantly differentiates between the two groups. Calculate and interpret the classification accuracy by creating a classification table (confusion matrix). Test whether the monthly expenditure of buyer and non-buyer is significantly different.

13. You are given a dataset containing 150 employees from different departments: Sales, Marketing, HR, and IT. The dataset employee.sav contains the following variables: Hours_worked per week, Training_hours per month, Job_satisfaction (1–10), Department, Monthly_sales (Rs. thousands). Use SPSS to compute mean, median, and SD of Monthly_Sales by department. Conduct an Independent Samples t-test to compare Job_Satisfaction between Sales and Marketing. Perform one-way ANOVA for Monthly_Sales across departments and interpret results.