1. **All** questions are **compulsory.**
2. **All questions** carry **equal** marks.
3. Draw **neat, labelled diagrams** wherever necessary

Q.1 Attempt the following (Any Three) [15 Marks]
   a. Explain characteristics of hypothesis.
   b. Explain strategies for hypothesis testing.
   c. Explain types of errors and level of significance in hypothesis.
   d. Explain t-test for mean μ (σ unknown).
   e. Given the p-values for hypothesis tests. Use the P-value to decide whether to reject H_0 when the level of significance is $\alpha = 0.10$
      i.   P = 0.0461
      ii. P = 0.0691
      iii. P = 0.0838
      iv. P = 0.0107
      v.   P = 0.0062
   f. For each claim, state H_0 and H_a in words and symbols. Then determine whether the hypothesis test is left-tailed test, right-tailed test or two-tailed test. Sketch a normal sampling distribution and shade the area for the P-value.
      i.   A school publicizes that the proportion of its students who are involved in at least one extracurricular activity is 61%.
      ii. A car dealership announces that the mean time for an oil change is less than 15 minutes.

Q.2 Attempt the following (Any Three) [15 Marks]
   a. Explain test for homogeneity.
   b. Explain chi-square distribution test for single variance.
   c. Explain chi-square contingency table test.
   d. Explain packages used for finding goodness of fit test, variance test, Mann-Whitney test in R and Python.
   e. A two-tailed F-test conducted on below samples produced the value 2.287. Complete the procedure for F-test and state whether to reject or fail to reject the null hypothesis.
      a. Sample 1: Variance = 109.63, sample size =41
      b. Sample 2: Variance = 65.99, sample size =21
   f. Compute U_x, U_y and U for the following samples for Mann-Whitney test.

X	60	45	23	32			
Y	10	25	20	54	32	65	8

Q.3 Attempt the following (Any Three) [15 Marks]
   a. Explain Kruskal-Wallis ANOVA test.
   b. Explain Friedman test.
   c. Explain two-factor ANOVA test.
   d. Write a short note on Mood's Median test.
   e. List and explain various packages used for finding ANOVA in R and Python.
   f. Explain MANOVA test with example.

Q.4 Attempt the following (Any Three) [15 Marks]
  a. Explain ARMA model.
  b. Explain generalized additive model.
  c. Write a short note on polynomial regression.
  d. Explain spatial series model.
  e. Explain trend analysis in trading.
  f. Explain multiple linear regression.

Q.5 Attempt the following (Any Three) [15 Marks]
  a. Explain the steps for creating a great data story.
  b. Explain the importance and benefits of data storytelling.
  c. Explain the elements of infographic design.
  d. Explain the steps in designing infographics.
  e. Explain the difficulties faced in good communication.
  f. Explain the contents for general documentation storage file.