REG.NO.:

VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2025-2026

SLOT: A1

Programme Name & Branch	:	B. Tech
Course Code and Course Name	:	CBS1009 & Computational Statistics
Faculty Name(s)	:	Dr. R. Padma & Dr. V. Kanimozhi
Class Number(s)	:	VL2025260104405, 4403
Date of Examination	:	5/10/2025
Exam Duration	:	90 minutes

Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes (Type the CO statements covered in this question paper. Use the CO number as per the syllabus copy)

CO3: Understand the concept of multivariate regression, by using multivariate analysis and interpreting experimental data.
CO4: Understand the concept of statistical analysis.

<table>
<tr><th>Q. No</th><th>Question</th><th>M</th><th>CO</th><th>BL</th></tr>
<tr><td>1.</td><td>A nutritionist studies the effect of three diets (Keto, Mediterranean and Vegan) on two health responses Weight Loss (kg) and cholesterol Reduction (mg/dL) over three months.
<table>
<tr><th>Diet</th><th>Weight Loss</th><th>Cholesterol Reduction</th></tr>
<tr><td>Keto</td><td>8, 7, 9, 10</td><td>20, 22, 18, 21</td></tr>
<tr><td>Mediterranean</td><td>6, 5, 7, 6</td><td>15, 14, 16, 15</td></tr>
<tr><td>Vegetarian</td><td>4, 3, 5, 4</td><td>12, 11, 13, 12</td></tr>
</table>
Use MANOVA to test whether diet type significantly affects health outcomes. Also mention, why it is better to analyse both weight loss and cholesterol reduction together rather separately using two ANOVAS?</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>2.</td><td>Consider the following data on one predictor variable Z_1 and two responses Y_1, Y_2
<table>
<tr><td>Z_1</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td>Y_1</td><td>5</td><td>3</td><td>4</td><td>2</td><td>1</td></tr>
<tr><td>Y_2</td><td>-3</td><td>-1</td><td>-1</td><td>2</td><td>3</td></tr>
</table>
Determine the least square estimates of the parameters in the multivariate multiple regression linear model $Y_{j1} = \beta_{01} + \beta_{11}Z_{j1} + \in_{j1}$, $Y_{j2} = \beta_{02} + \beta_{12}Z_{j1} + \in_{j2}$ for j = 1, 2, 3, 4, 5. Also compute the residual.

Use the results to calculate a 95% confidence interval for the mean response $E[Y_{01}] = \beta_{01} + \beta_{11}Z_{01} + \in_{01}$ corresponding to $Z_{01} = 0.5$.</td><td>3</td><td>3</td><td>3</td></tr>
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3	A television broadcasting company wants to segment its viewers into two groups: young audience and adult audience. Based on the data collected from viewers. the following information is available: a). Identify the best direction that separates the class. b). Using LDA classify the new viewer, V7 who watches 18 hours per week and subscribed 5 channels.	4	4	3
4	A hospital records the number of patients admitted for three different illness over three days. After computing the statistics, the covariance matrix of the data is provided below. $\Sigma = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 2 & 1 \\ -1 & 1 & 3 \end{bmatrix}$ a). Identify which illness shows the highest variability, based on the principal components. b). Compute the loadings. Interpret your result and suggest what this might mean for hospital planning and resource allocation.	4	4	3
5.	A logistics company is monitoring five delivery robots operating inside a warehouse. Their current locations are given by the coordinates (x, y): (2,1), (5,4), (3,8), (9,6) *and* (8,2). Using the Euclidean distance metric perform the hierarchical agglomerative clustering on these data points. Construct the dendrograms and determine the cluster formations under the following methods: (a) single linkage (b) Complete linkage (c) Average linkage. Also, interpret the final clusters formed.	5	4	2

Viewer	Hours Watched per week	Channels Subscribed	Viewer Group
V1	10	3	Young audience
V2	8	2	Young audience
V3	12	4	Young audience
V4	25	6	Adult audience
V5	22	5	Adult audience
V6	28	7	Adult audience

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