SLOT: A2 + TA2

REG.NO.:

VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF MECHANICAL ENGINEERING
CONTINUOUS ASSESSMENT TEST (CAT) -II
FALL SEMESTER 2026-2027

Programme Name & Branch	: B.Tech Mechanical Engineering (EV Specialisation)
Course Code	: BAMEE344
Course Name	: Electric Vehicle Instrumentation and Data Analytics
Faculty Name(s)	: [redacted]
Class Number(s)	: VL2026270101342
Date of Examination	: 27 September 2026 (Sunday)
Time of Examination	: 11:00 AM to 12:30 PM (FN2)
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 Statements:
  CO 5: Analyse EV measurement and sensor data using statistical, signal processing, and machine learning techniques for diagnostics and predictive maintenance applications.

Q. No	Question	M	CO	BL
1.	Explain the steps involved in performing exploratory data analysis on an EV battery dataset. For each step, state what the engineer looks for and how it helps prepare the data for model development. Illustrate your answer using the Ather 450X connected-fleet dataset (variables such as SOC, pack voltage and current, motor speed, cell temperatures and odometer) as the case example.	10	5	3
2.	a) Explain why data analytics is needed in EV engineering. State what it helps an engineer do and how it supports better decisions. **(5 marks)** b) Explain Artificial Intelligence, Machine Learning and Deep Learning with an example of each, and describe the main branches of it, with an EV example of each. **(5 marks)**	10	5	2, 3
3.	Explain what segmentation and clustering mean and why clustering is called an unsupervised method, and how it helps an engineer make sense of an unlabelled EV fleet dataset. Using the Ather fleet study, where a single range model over all vehicles gave about ±6 km error while three usage-cluster models gave about ±2 km, explain how identifying usage segments leads to better models and decisions.	10	5	2, 3
4.	a) Explain what a model is in EV data analytics, and describe the main types of models with an example of each. **(5 marks)** b) Explain what these models do, that is engineering tasks they perform, using examples or a case study, and how poorly prepared data affects the model built. **(5 marks)**	10	5	2, 3
5.	Explain the common regression models used in EV data analytics and state which model is suitable for which type of EV problem. Taking State of Charge (SOC) estimation as an example, explain how you would develop a suitable regression model and check that it works well.	10	5	2, 3

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