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

SLOT: B2

REG. NO.:

SCHOOL OF MECHANICAL ENGINEERING
CONTINUOUS ASSESSMENT TEST - I
WINTER SEMESTER 2025-2026

Programme Name & Branch	**: B Tech & Automotive/Mechanical Engineering**
Course Code	**: BAMEE318**
Course Name	**: Vehicle Systems Engineering**
Faculty Name(s)	**: Dr Ravi K**
Class Number(s)	**: VL2026270101437**
Date of Examination	**: 10/08/2026**
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 Outcome Statements:

  CO 1: Explain the layout, structural design, materials, and safety considerations of vehicle chassis and body systems.

  CO 2: Describe the working principles and performance characteristics of internal combustion engine (ICE) powertrain systems, including emission formation and control techniques.

  CO 3: Analyze drivetrain components such as clutches, gearboxes, propeller shafts, and differentials for efficient power transmission in conventional and electric vehicles.

  CO 4: Examine the principles and performance of vehicle control systems, including steering, braking, and stability mechanisms.

  CO 5: Evaluate suspension, comfort, and convenience systems to enhance ride quality, ergonomics, and user experience in modern vehicles.

Q. No	Question	M	CO	BL
1.	Critically evaluate the structural rigidity, weight distribution, and crash safety performance of a modern unibody (monocoque) crossover layout like the Kia Syros against a conventional body-on-frame (ladder chassis) compact SUV. Formulate a technical argument defending which architectural layout offers a superior balance between manufacturing costs, urban fuel efficiency, and passive occupant safety under stringent crash-test safety parameters.	10	1	3
2.	Hypothesis an appropriate clutch for an MPV with due consideration on the limitations of utilizing a single plate clutch. Explain its construction and operation using the relevant drawings.	10	3	4
3.	A vehicle manufacturer is designing a low-cost, entry-level commuter hatchback under strict manufacturing budget and	10	3	4

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	engine bay packaging constraints. Evaluate the mechanical trade-offs between sliding mesh, constant mesh, and synchromesh architectures regarding NVH (Noise, Vibration, and Harshness), mechanical efficiency, and manufacturing complexity. Based on your evaluation, synthesize an optimized transmission blueprint for this specific vehicle class. Justify why a hybrid or non-uniform selection of these gear types across different gear ratios (including reverse) might yield the most cost-effective and durable solution.			
4.	a) Sketch the component layout of 4WD driveline system to transfer power from the engine to the wheels. State the purpose of each component.	5	3	3
	b) Suggest the type of rear axle suitable for a truck and justify their choice.	5		
5.	In recent years, the Government of India has significantly tightened automotive manufacturing standards to reduce road fatalities. Discuss the major passive safety practices that Indian cars are required to meet current mandate frameworks using necessary drawings and equations.	10	1	3