

Course Code: AT459**Course Name: Electric and Hybrid Electric Vehicles**

Day & Date: Thursday, 18/09/2025

Time: 10:15am to 12:15pm

Max Marks- 50

- Instructions:**
- 1) All questions are compulsory.
 - 2) Figures in rounded () brackets within the question, indicate the scheme of marking for respective part of the question, whereas, figures in the first right column indicate total marks for that whole question.
 - 3) CO is the index number of the Course Outcome statement.
 - 4) The Bloom's taxonomy level (BL) for 1,2,3,4,5 and 6 is remember, understand, apply, analyze, evaluate and create respectively.
 - 5) Assume suitable data if necessary.
 - 6) Use of non-programmable calculators is allowed

| | | Marks | BT Level | COs |
|-----|---|-------|----------|-----|
| Q.1 | A Explain Well-to-Wheel Analysis (5) with neat figure (4) | 09 | 5 | CO1 |
| | B Explain need of EVs and HEVs (4) and also describe effects of pollutants (4) | 08 | 2 | CO1 |
| | C Explain (5) performance curve (3) of a Conventional typical manual transmission | 08 | 5 | CO1 |
| Q.2 | A An electric vehicle (EV) is powered by a motor that delivers a torque of 200 Nm. The vehicle has a gear ratio 4, a final drive ratio 3.5, and a transmission efficiency 0.9. The dynamic wheel radius 0.3 m. The total mass of the vehicle including passengers is 1500 kg. The vehicle experiences rolling resistance with coefficient 0.015, aerodynamic drag coefficient is 0.29, frontal area $A=2.2 \text{ m}^2$, and operates in air of density $\rho=1.225 \text{ kg/m}^3$. Determine the tractive force at the wheel. | 09 | 5 | CO2 |
| | B Explain the EV design process (4) and Issues (4) in detail | 08 | 2 | CO2 |
| | C Illustrate electric motor characteristics (4) and also traction motor characteristics with figure (4) | 08 | 2 | CO2 |

