

GUJARAT TECHNOLOGICAL UNIVERSITY

BE(MINOR)- SEMESTER-I&II EXAMINATION – SUMMER 2025

Subject Code:117AL01

Date:30-05-2025

Subject Name: Vehicle Dynamics

Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Define: Euler angles, heading angle and slip angle with respect to vehicle.	03
	(b) Which are the moments acting on the vehicle during motion? Define each moments.	04
	(c) Explain the procedure to locate center of gravity of passenger car with suitable example.	07
Q.2	(a) Differentiate power limited and traction limited acceleration of vehicle.	03
	(b) Draw force diagram for rear wheel drive vehicle decelerate on slope. Enlist all the forces acting on it.	04
	(c) Explain the basic principal operation of anti-lock braking system for passenger car.	07
	OR	
	(c) What is brake factor and braking efficiency? Derive the expression to calculate brake factor for drum brake.	07
Q.3	(a) Define boundary layer in terms of vehicle aerodynamics. What is the importance of it on vehicle aerodynamics?	03
	(b) Explain the procedure for wind tunnel testing of vehicle scale model.	04
	(c) Explain the various aerodynamic drag reduction techniques with suitable diagram.	07
	OR	
Q.3	(a) Define: Aerodynamic drag, lift and cross wind sensitivity.	03
	(b) Explain the pressure distribution around the vehicle body with suitable diagram.	04
	(c) Draw the kinematic arrangement for independent suspension systems of four wheeler.	07
Q.4	(a) Draw single degree of freedom quarter car model for passenger car and write mathematical expression for the same.	03
	(b) Explain the necessary conditions for anti-squat and anti-dive suspension geometry.	04
	(c) Explain necessary conditions of understeer, oversteer and nutralsteer.	07

OR

- Q.4** (a) Explain low speed turning model for vehicle steering system. **03**
(b) Explain four wheel steering system for passenger car, with suitable kinematic arrangement. **04**
(c) Define roll center? Explain the procedure to locate roll center for different types of rigid axle suspension systems. **07**

- Q.5** (a) Describe the forces responsible to rollover the suspended vehicle with neat sketch. **03**
(b) Derive the vehicle model for transient roll behaviour of vehicle. **04**
(c) Enlist and define cornering properties of tyre and explain their effect on vehicle performance. **07**

OR

- Q.5** (a) Encrypt the following tyre specification and calculate the outer diameter of this tyre. **03**

P185/70 R 14 89T

- (b) How rolling resistance is generated by tyre? Which are the parameters affecting rolling resistance? **04**
(c) What is friction circle diagram? Explain the procedure to plot it and further describe the use of friction circle to analyze dynamic behaviour of vehicle. **07**
