GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–VII EXAMINATION – WINTER 2025

Subject Code:3170203   **Date:13-11-2025**

Subject Name:Vehicle Dynamics

Time:10:30 AM TO 01:00 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: Lumped mass, Sprung mass and Unsprung mass of vehicle.	**03**
	(b)	Draw force diagram for four wheel drive vehicle accelerating with high speed on slope. Enlist all the forces acting on it.	**04**
	(c)	Draw vehicle fixed coordinate system. Define all vehicle motion with reference to right hand orthogonal system.	**07**
Q.2	**(a)**	Enlist different aerodynamics aids for drag reduction.	**03**
	(b)	Define all road loads acting on vehicle during motion. How to calculate engine power consumption due to road loads?	**04**
	(c)	What is brake proportioning? What is the role of pressure proportioning valve? Derive maximum braking force acting on front and rear axle for passenger vehicle.	**07**
		OR	
	(c)	Explain the method to determine power limited acceleration and traction limited acceleration.	**07**
Q.3	**(a)**	Enlist the functions of tyre with respect to vehicle dynamics point of view.	**03**
	(b)	What is the application of tyre magic formula? Write down the expression of it and enlist all the parameters used in this.	**04**
	(c)	Explain the kinematic arrangement of different types of solid axle and independent suspension system.	**07**
		OR	
Q.3	**(a)**	Why 100% anti-dive suspension geometry is no used in passenger vehicle?	**03**
	(b)	Draw vehicle tyre axis system.	**04**
	(c)	Define traction and cornering properties of tire and explain their effect on vehicle performance.	**07**
Q.4	**(a)**	Explain Ackerman turning geometry.	**03**
	(b)	Explain passive and semi-active suspension system of a vehicle.	**04**
	(c)	Analyze the effect of forces and moments generated on tyre on the steering system with suitable diagram.	**07**
		OR	
Q.4	**(a)**	Differentiate low speed turning and high speed turning.	**03**
	(b)	Define the necessary conditions for under steer and oversteer.	**04**
	(c)	What is roll center? Explain the procedure to locate roll center for any three types of independent suspension systems.	**07**

Q.5	**(a)**	Describe the forces acting to rollover the rigid and suspended vehicle.	**03**
	(b)	Evaluate the vehicle model for transient roll behaviour.	**04**
	(c)	Explain the procedure to locate center of gravity of motorcycle.	**07**

OR

Q.5	**(a)**	Explain roll steer and its effect on understeer gradient.	**03**
	(b)	Enlist the parameters affecting under steer variation for front wheel drive vehicle.	**04**
	(c)	Describe the steering geometry of motor cycle.	**07**

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