Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2022

Subject Code:3170203   **Date:16-01-2023**
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)**	Explain Earth fixed co-ordinate system with neat sketch.	**03**
	(b)	Explain Pressure distribution around the vehicle	**04**
	(c)	Derive an equation to calculate the dynamic axial load for the following condition (i) Vehicle is on ground (ii) Vehicle is in low speed acceleration (iii) vehicle is on grade.	**07**
Q.2	**(a)**	Enlist the various aerodynamic aids for drag reduction for passenger car.	**03**
	(b)	Define (1) Camber angle (2) Caster angle (3) toe-in (4) Toe-out	**04**
	(c)	Draw SAE tyre axis system and define each term to describe the tyre and its axis systems.	**07**

OR

	(c)	Explain the meaning of the following tyre size code and calculate the tyre height for given tyre. P 215 / 60 R 15 96 H.	**07**
Q.3	**(a)**	Which are the primary functions of suspension system with respect to dynamic behavior of a vehicle?	**03**
	(b)	Construction of Bias & Radial tyre with the help of neat sketch.	**04**
	(c)	Define and illustrate the conditions of anti squat and anti dive suspension geometry for a passenger car.	**07**

OR

Q.3	**(a)**	Explain Anti dive suspension geometry.	**03**
	(b)	Define traction and cornering properties of tyre.	**04**
	(c)	Draw quarter car model of vehicle representing passive suspension system. Obtain the mathematical model for the same in steady state vibration for sprung and un sprung mass.	**07**
Q.4	**(a)**	What is the important of rollover? List types of rollover of the vehicle.	**03**
	(b)	Explain difference between independent suspension and dependent suspension.	**04**
	(c)	Explain Quasi-static rollover of a suspended vehicle.	**07**

OR

Q.4 (a) When quasi-static model and transient response model for rollover is applied?　**03**

(b) Explain MacPherson Strut Suspension system with neat sketch.　**04**

(c) How can low speed maneuverability and high speed cornering improve by four wheel steering? Explain in details.　**07**

Q.5 (a) Differentiate understeer and oversteer condition in vehicle.　**03**

(b) Derive Ackerman steering condition. Which assumptions are considered while applying this condition?　**04**

(c) Explain following term for motor cycle.　**07**
1. Tyre rolling resistance
2. Aerodynamic resistance forces
3. Resistant force caused by slope

OR

Q.5 (a) Which types of front and rear suspension are provided in motor cycle?　**03**

(b) Explain steering system forces and moments.　**04**

(c) Explain with neat sketch Kinematic structure of motorcycle.　**07**

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