Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – WINTER 2015

Subject Code: 170203 **Date: 09/12/2015**

Subject Name: Vehice Dynamics

Time: 10:30am to 1:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Show arbitrary forces acting on a vehicle with a clear sketch of vehicle moving on up gradient, with hitch load at an acceleration a_x and derive the dynamic forces W_f & W_r acting on front & rear tyres.	**07**
	(b)	Explain empirical and analytical methods for understanding of vehicle dynamics performance, along with its benefits and limitations.	**07**
Q.2	**(a)**	Draw SAE Axis system and vehicle Earth Coordinate system to explain vehicle dynamic forces and define Euler angles.	**07**
	(b)	Define brake factor in case of drum brake system. Draw forces acting on brake shoes and explain self servo effect.	**07**
		OR	
	(b)	Explain relationship and impact of vehicle speed to stopping distance, stopping time and energy consumed in braking.	**07**
Q.3	**(a)**	Describe the importance of Power to weight ratio for Acceleration performance and fuel consumption performance of vehicle.	**07**
	(b)	Explain Types of Tyres and its advantages and dis-advantages in detail along with neat sketches.	**07**
		OR	
Q.3	**(a)**	A vehicle having following specifications: i) maximum engine torque = 300 Nm, ii) 1st Gear Ratio of 1: 3.7 iii) 2nd Gear Ratio of 1: 2.4 iv) 3rd Gear Ratio of 1: 1.6 v) 4th Gear Ratio of 1: 1.0 vi) 5th Gear ratio of 1: 0.9 AND vii) Final drive ratio of 3.6:1 AND viii) rolling radius of tyres 0.25 m, Calculate Tractive force F_x for each of the Gears.	**07**
	(b)	Explain the vehicle performance parameters and relationship with Tyres properties.	**07**
Q.4	**(a)**	Describe total braking force of front axle & Rear axle with the graph and explain the necessity of brake proportioning.	**07**
	(b)	Explain various sources of Ride excitation forces in a vehicle moving on the road and various damping solutions suggested for different type of vehicles.	**07**
		OR	
Q.4	**(a)**	Explain three types of brake proportioning method in detail.	**07**
	(b)	Draw neat sketch of Tyre axis system and explain details.	**07**

Q.5	**(a)**	Describe various types of suspensions used in automobiles and its advantages and disadvantages in detail.	**07**
	(b)	Explain the various steering systems and its performance impact.	**07**

OR

Q.5	**(a)**	Explain in detail effect of Aerodynamic drag and Aerodynamic aids on performance of vehicle.	**07**
	(b)	Define Neutral Steer, Under steer & Over steer conditions and explain how these conditions affect the performance of the vehicle. Also discuss the parameters that can be varied to change the condition.	**07**

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