GUJARAT TECHNOLOGICAL UNIVERSITY ME - SEMESTER-II EXAMINATION – SUMMER 2015

Subject Code: 2721110 Date: 30/0 Subject Name: Vehicle Dynamics			
Time: 02:30 PM to 05:00 PM Total Marl			
	1. 2. 3.	Attempt all questions. Figures to the right indicate full marks. Make suitable assumptions wherever necessary.	
Q.1	(a)	 Define: 1. Vehicle fixed coordinate system, 2. Earth fixed coordinate system. 3. Lumped mass. 	07
	(b)	Explain briefly Anti-Lock Braking System.	07
Q.2	(a) (b)	Derive fundamental expressions for basic braking with constant deceleration. Write a brief note on õCruise Control and Adaptive cruise controlö.	07 07
	(b)	What is tire-road friction? Explain in terms of braking coefficient and slip.	07
Q.3	(a) (b)	Describe pressure distribution over an automobile vehicle. Elaborate different factors which affect rolling resistance.	07 07
Q.3	(a)	Explain ó õRolling Resistanceö. List out mechanisms responsible for rolling resistance.	07
	(b)	What are the needs of aerodynamic aids in automobile vehicles? Describe the use of bumper spoiler and deck lid spoiler with proper diagrams.	07
Q.4	(a)	Define: 1. Pitching Moment, 2. Yawing Moment, 3. Rolling Moment,	07
	(b)	Calculate aerodynamic resistance and power necessary to overcome aerodynamic resistance at driving speeds 10 m/s and 60 m/s for following parameters: Aerodynamic drag coefficient = 0.3, Cross sectional area = 2 m^2 , mass density of air = 1.226 Kg/m^3 , neglect wind speed. Use Power = aerodynamic resistance × driving speed.	07
Q.4	(a) (b)	Explain various excitation sources for exciting vehicle ride vibration briefly. Describe ó õSuspension Stiffnessö.	07 07
Q.5	(a) (b)	Explain ó õLow-speed Turningö. Calculate the applied tractive force and maximum permissible tractive force for a rear wheel drive car with following specifications: Wheel type = P215/65R15, Engine torque = 2000 Nm, Efficiency of whole powertrain = 0.8, transmission ratio of first gear = 5.5, Rear axle ratio = 4.5, Weight of the car on rear wheel = 1×10^6 N, Adhesion coefficient between tire and road surface = 0.7. Also check whether the produced tractive effort at rear wheel is exceeding the maximum namingible limit.	07 07
		OR	
Q.5	(a)	Derive steady state cornering equation.	07

- (b) A vehicle of total weight 5000 kg, is held at rest on a slope of 10°. It has a 07 wheel base of 225 cm and its center of gravity is 100 cm in front of the rear axle and 150 cm above the ground level. Find:
 - a) What are the normal reactions at the wheels?
 - b) Assuming that sliding does not occur first, what will be the angle of slope so that the vehicle will overturn?
 - c) Assuming all the wheels are to be braked, what will be the angle of the slope so that the vehicle will begin to slide if the co-efficient of adhesion between the type and the ground is 0.35?
