Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER M.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: VEHICLE BODY DYNAMICS [AAE 5202]

REVISED CREDIT SYSTEM
(22/04//2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. Derive an expression for the maximum grade that a mini-van with boat trailer can climb without slippage for this vehicle combination in front-wheel-drive, rear-wheel-drive and four-wheel drive power train. **(05)**

1B Calculate the maximum gradeability with a coefficient of friction of 0.3, given the following information on the vehicle with trailer. **(05)**

Vehicle properties	trailer properties
Front axle = 689.5 kg Rear axle = 521.5 kg CG height = 622.3 mm Hitch height = 355.6 mm Hitch rear overhang = 584.2 mm Wheel base = 3048 mm	Axle = 544 kg Hitch load = 113.4 kg Wheel base = 2794 mm CG height = 889 mm

2A. Explain the factors affecting Dynamics of Vehicle with and without trailer. **(04)**

2B. A motor car has a wheel base of 2.7 m and the height of its c.g. above the ground is 0.6 m and it is 1.1 m in front of the rear axle. If the car is traveling at 50 km/hr on a level track, determine the minimum distance in which the car may be stopped, when breaks applied to Front wheel only, Rear wheel only and All wheel. **(06)**

3A. With neat sketch, explain the concept of boundary layer **(05)**

3B. A heavy truck weighing 32885.5 kg rolls at 107.8 km/h. the air temperature is 13°C and barometric pressure is 26.01 in Hg. The truck is 203 mm wide by 343 mm height, and has an aerodynamic drag coefficient of 0.65. the truck has radial ply tires. Calculate the aerodynamic drag, rolling resistance and the road load horse power at these conditions. **(05)**

4A. List and explain the different forces and moments acting on Tires. **(03)**

4B. Explain the Tire brush model at braking and side force with suitable sketches **(07)**

5A. Explain the working and significance of Anti-lock braking system in vehicle with respect to dynamics. **(05)**

5B. Derive an equation to find Natural frequency and mode shapes for Quarter car model by considering driver **(05)**