

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – SUMMER 2024****Subject Code:2170203****Date:24-05-2024****Subject Name:Vehicle Dynamics****Time:02:30 PM TO 05:00 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.

- Q.1** (a) What is Vehicle Axis System and Earth Fixed Axis System? **03**
 (b) Define: Vehicle Performance, Handling and Ride. **04**
 (c) Draw and explain the following 1) Aerodynamic drag 2) Aerodynamic lift 3) Side force 4) Rolling moments 5) Pitching moments. **07**
- Q.2** (a) Write a short note on aerodynamic drag. **03**
 (b) Draw force diagram for rear wheel drive vehicle moving on the grade with high speed. How much load is acting on the rear axle? **04**
 (c) What is vehicle rollover? Explain the mechanics involved in rollover of a vehicle under static condition. **07**
- OR**
- (c) Explain wind tunnel test with neat sketch. **07**
- Q.3** (a) Define wheel center, camber angle and suspension roll. **03**
 (b) Discuss in details various factors affecting on tyre life. **04**
 (c) Explain Types of Tires and its advantages and dis-advantages in detail along with neat sketches. **07**
- OR**
- Q.3** (a) Give the name of major elements of tyre and their suitable materials. **03**
 (b) Write a short note on cornering force produced by vehicle tire. **04**
 (c) Draw SAE tyre axis system and define each term to describe the tyre and its axis systems. **07**
- Q.4** (a) What do we want from suspension geometry? **03**
 (b) Draw kinematic arrangement of short and long arm type suspension and Mac Pherson type suspension. **04**
 (c) Explain the procedure to locate roll center for Hotchkiss rear suspension, McPherson suspension and Double A-arm suspension with suitable diagram. **07**
- OR**
- Q.4** (a) Explain Anti squat suspension geometry. **03**
 (b) Distinguish independent suspension and dependent suspension. **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.5** (a) Explain under steer, over steer and natural steer.. **03**
 (b) Differentiate between Davis steering and Ackerman steering mechanism. **04**
 (c) How can low speed maneuverability and high speed cornering improve by four wheel steering? Explain in details. **07**
- OR**
- Q.5** (a) What is the important of rollover? List types of rollover of the vehicle. **03**
 (b) For Stopping distance - SD and stopping time- ts Derive equations for Stopping distance and stopping time. **04**
 (c) Explain: How four wheels steering improve low speed and high speed turning? **07**
