

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-VII (NEW) EXAMINATION – WINTER 2024****Subject Code:2170203****Date:04-12-2024****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.

- Q.1** (a) Explain SAE Vehicle axis. **03**
 (b) Derive the equation to calculate the dynamic axle load when the vehicle on level ground under static condition. **04**
 (c) Draw and Explain various Aerodynamic Forces and Moments acting on the vehicle. **07**
- Q.2** (a) Explain lumped mass of vehicle. **03**
 (b) List the various shape of vehicles and give the value of Aerodynamic Drag coefficient for each shape of vehicle. **04**
 (c) The curb weight of a continental 4-door sedan without passengers or cargo are 1049kg on the front axle and 599.6kg on the rear. The wheelbase, L, is 109inches. Determine the fore/aft position of the center of gravity for the vehicle. **07**
- OR**
- (c) What is braking coefficient? Explain the parameters which affect braking coefficients **07**
- Q.3** (a) Give the name of major elements of tyre and their suitable materials. **03**
 (b) Discuss in details various factors affecting on tyre life. **04**
 (c) Explain magic tyre formula and illustrate its applications to calculate lateral force and longitudinal forces. **07**
- OR**
- Q.3** (a) Define traction and cornering properties of tyre. **03**
 (b) Define ride and explain ride dynamic system. **04**
 (c) Draw clear sketch of Tyre axis system and explain the details. **07**
- Q.4** (a) Explain Difference between dependent and independent suspension system. **03**
 (b) Draw and explain antdive suspension geometry **04**
 (c) Explain Active suspension and Roll centre analysis. **07**
- OR**
- Q.4** (a) Justify need of suspension system. **03**
 (b) Explain MacPherson Strut Suspension system. **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 unsprung mass. **07**
- Q.5** (a) Differentiate between Davis steering and Ackerman steering mechanism. **03**
 (b) Define wheelbase and steering axis angle of motorcycle. **04**
 (c) Explain the following turning response properties: 1) Under steer gradient. **07**
 2) Neutral steer. 3) Under steer. 4) Over steer. 5) Characteristic speed and Critical speed
- OR**
- Q.5** (a) What is the important of rollover? List types of rollover of the vehicle. **03**
 (b) What is quasistatic rollover of a suspended vehicle? Draw and explain roll reaction on vehicle. **04**
 (c) How to locate center of gravity of motor cycle? Show all necessary calculations with suitable diagram. **07**
