Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 50352

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Fifth/Sixth Semester

Automobile Engineering

CAU 332 — DYNAMICS OF GROUND VEHICLES

(Common to : Mechanical Engineering

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define magnification factor?

2. What is the difference between a discrete and a continuous system?

3. What is hydroplaning?

4. List out the factors affecting rolling resistance at different slip angles

5. What is the difference between quarter car and bicycle model?

6. What are the basic requirements of a suspension system in the vehicle

7. Define the following term (a) force (b) torque.

8. How the location of the center of gravity is found for vehicles?

9. What are the effects of suspension on cornering?

10. What is meant by minuro Plot for Lateral Transient Response.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the single, two and multi-degree of freedom system with characteristic features.

Or

(b) The springs of an automobile trailer are compressed 0.1 m under its own weight. Find the critical speed when the trailer is passing over a road with a profile of sine wave whose amplitude is 80 mm and the wavelength is 14 m. Find the amplitude of vibration at a speed of 60 km/h.

12. (a) Describe the phenomenon of the interaction of combined Lateral and Longitudinal Forces on the tyres.

Or

(b) Explain the various tests carried out on tyres along with their tractive, cornering and ride properties.

13. (a) Discuss the design and analysis of Passive and Active suspension using the Quarter car model.

Or

(b) Explain the different Suspension optimization techniques in detail with advantages and disadvantages.

14. (a) Derive the equations for maximum acceleration, tractive effort and reaction forces for different drive vehicles.

Or

(b) Explain the construction and working of the vehicle dynamic control system with its advantages and disadvantages.

15. (a) Explain the following Turning response properties with its features, advantages and disadvantages:

(i) Neutral steer, Under steer and Over steer, (7)

(ii) Characteristic speed and Critical speed. (6)

Or

(b) A car whose wheelbase is equal to five times the height of its center of gravity above the ground, is moving on a horizontal road when brakes are applied. If the coefficient of limiting friction between car tyres and the road is 0.5, determine the percentage of weight transferred from the rear to the front axle on braking.

PART C — (1 × 15 = 15 marks)

16. (a) A vehicle of total weight 49050 N is held at rest on a slope of 100. It has a wheelbase of 2.25 m and its center of gravity is 1.0 m in front of rear axle and 1.5 m above the ground level. Find (i) What are the normal reactions at wheels (ii) assuming that sliding does not occur first, what will be the angle of the slope so that the vehicle will overturn? (iii) Assuming all the wheels are to be braked. What will be the angle of slope, so that the vehicle will begin to slide if the coefficient of adhesion between the tire and the ground is 0.35? (5+5+5 =15)

Or

(b) Explain the construction and working priciples of the Antilock Braking System (ABS) with a neat sketch.