VEHICLE DYNAMICS

ASSIGNMENT-1

1. Derive the equation to calculate the dynamic axle load for the following Condition of four wheeler.
   i) When the vehicle on level ground under static condition.
   ii) When the vehicle on grads with low speed acceleration.

2. Explain vehicle fixed co-ordinate system with neat sketch.
3. Explain Lumped mass and Sprung, Un-sprung mass.

4. Explain Euler angles
5. Draw SAE axis system.
6. Derive Tractive force for power limited Acceleration.
7. Derive Tractive force for traction limited acceleration.

8. Explain methods of Brake proportioning along with the graph of brake forces on front axle and rear axle.
9. For Stopping distance - SD and stopping time - t_s :
   i) Derive equations for Stopping distance and stopping time.
   ii) Discuss relationship of both with respect to vehicle velocity.
   iii) Energy absorbed during braking.

Vehicle dynamics
Assignment 2

1. Explain roll centre analysis.
2. Define suspension roll centre and roll axis. Explain the procedure for finding roll centers for solid axle suspension and independent suspension.
3. Enlist primary function of suspension system. Explain various types of independent suspension system.
4. Compare active and passive suspension system based on different performance mode.
5. Describe various types of suspension system used in automobile and its advantage and disadvantage in detail.
6. Draw neat sketches and discuss merits of each type of front and rear suspension systems.
7. Explain active, passive and semi-active suspension with neat sketch.

Assignment 3

1. Explain tire cornering forces with equations.
2. Explain tire axis system with moments and forces with neat sketch (imp question).
3. Explain importance of power to weight ratio in automobile.
4. Explain types of tyres with merits and demerits with sketches.
5. Explain different tire properties and enlist the parameters which affect tire properties
6. Explain slip angle, inflation pressure and tread design.

Assignment 4

1. Define understeer, neutral steer and oversteer conditions and explain how these conditions effect the performance of vehicle.
2. Explain shimmy and wobble effect of steering system
3. Differentiate ackerman and davis steering mechanism
4. Explain four wheel steering system. What is the effect of 4 wheel steering system on low speed and high speed turning.
5. Define steering geometry error. Explain steering geometry error on dynamics of vehicle.
6. Explain various steering system and its performance effect.
7. Explain roll steer, side slip angle, yaw velocity gain.