

MODEL QUESTION PAPER

Sixth Semester B.Tech. Degree Examination

13.605 VEHICLE DYNAMICS (U)

Time: 3 Hours

Max. Marks: 100

PART- A

Answer *all* questions. Each question carries 4 marks

1. What are the factors affecting rolling resistance of an automobile?
2. How do you determine CAFE standards of a manufacturer for a model year?
3. Draw the air streamlines and mark the pressure variations over the profile of a car.
4. Discuss the stability of a vehicle on a slope
5. Explain the terms wheel hop, wheel wobble, wheel wander and wheel shimmy

(5 X 4 =20 Marks)

PART- B

Answer any *One* full question from each module. Each question carries 20 marks

Module I

6. Derive the relation for the total resistance offered on a moving vehicle. Also derive the equation for the power required to propel a vehicle

OR

7. An engine is required to power a truck having a gross weight of 40937 N. The maximum grade which the truck will have to negotiate at 32km/hr in 2nd gear is expected to be 20% (% grade = $\tan\theta \times 100$). The rolling resistance coefficient is 0.017 and the air resistance coefficient is 0.0324 in the relation, Total resistance = $K_f W + K_a A V^2$ kgf. The frontal area is 5.2m². the transmission efficiency in 2nd gear is 80%. Calculate the minimum power which should be available from the engine and the gear ration in 2nd gear if this power is available at 2400rpm and the effective radius of the wheels is 0.419m. Also calculate the

minimum speed of the vehicle in top gear on level road at the same engine speed assuming transmission efficiency of 90% in top gear. What is the gear ratio in top gear? The differential has a reduction of 3.92.

Module II

8. What are the factors affecting Rolling Resistance? Explain aerodynamic drag and aerodynamic lift. How does it affect the stability of a vehicle?

OR

9. What do you mean by cornering force? Explain the suspension effect on cornering. Also explain self righting torque

Module III

10. Explain the dynamics of a vehicle on a banked track.

OR

11. Explain the various methods for the measurement of aerodynamic drag force in a coast.

Module IV

12. What do you mean by independent suspension? Derive the relation for various forces acting on it.

OR

13. How are tyres specified? Explain the effect of driving and braking torque on the tyre and factors affecting tyre life.

(4 X 20 =80 Marks)