B.Tech Degree Exam, May 2014

Eighth Semester

Branch: Automobile Engineering

AU010 804L03 Vehicle Dynamics

Time: 3hrs   Maximum marks : 100

Part-A (3m*5)

1. Discuss the term gradability and give the mathematical expression for the same.

2. Write down the requirements of a vehicle suspension system.

3. Give the expression for work done in braking.

4. Explain the term under steer.

5. What do you mean by aerodynamic drag? Give the expression for drag coefficient.

Part-B (5m*5)

1. Give expression for power for propulsion. Explain the terms (a) Air resistance (b) Rolling resistance (c) Grade resistance

2. What are three elementary parts of a vibratory system? Explain briefly.

3. Explain the terms (a) pitching (b) yawing (c) rolling.

4. Discuss about coast- down test.

5. Explain the significance of gyroscopic effect.

Part-C (12m*5)

1. Explain (a) Critically damped, under damped and over damped free vibration.

      (b) Transmissibility in vibration.

OR

2. A motor vehicle weighs 7975.5 N and its engine develops 14.7 kW at 2500 rpm. At this engine speed the road speed of the car on the top gear is 64.37 km/hr. Bottom gear reduction is 3.5:1 and the efficiency of transmission is 88% on top and 80% on bottom gear. The diameter of tire is 0.762 meter and the projected front area of the vehicle is 1.116 m^2. The coefficient of air resistance is 0.0314 N- h^2/km^2-m^2. R= KAV^2, where R is the air resistance in Newton, K is coefficient of air resistance, A is the front area in m^2, V is speed in km/hr. Road resistance is 0.023 times weight of vehicle in Newton. Calculate

   (a) speed of car on bottom gear

   (b) tractive effort available at the wheels on top and bottom gear.

3. For a typical motor car, the road resistance is given by 23 N per 1000N, the air resistance by the expression $0.0827 \, V^2$. Transmission efficiency is 88% in top speed, car weighs 19934 N when fully loaded. Calculate the acceleration in m/s^2 at 48km/hr, assuming the torque at 48 km/ hr in the top gear is 25% more than at 144 km/hr.

<center>OR</center>

4. With the help of road performance curve explain acceleration, gradability and drawbar pull.

5. With a neat sketch, explain constructional details and working of single- tube telescopic damper.

<center>OR</center>

6. What do you mean by rigid axle beam suspensions? Write advantages and disadvantages of beam axle.

7. Explain the weight distribution on three and four wheeled vehicles and expressions for final reactions on the wheels.

<center>OR</center>

8. A motor car has a wheel base of 2.64 meter, the height of its centre of gravity above the ground is 0.61 meter and it is 1.12 meter in front of the rear axle. If the car is travelling at 40 km/ hr on a level track, determine the minimum distance in which the car may be stopped, when (a) the rear wheels are braked (b) all wheels are braked

9. Explain ride characteristics of radial- ply and bias- ply tires.

<center>OR</center>

10. Discuss in detail about different tests for measuring aerodynamic drag forces.