

Roll No. 

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech. (AE) (Sem.-6)**  
**VEHICLE DYNAMICS**  
**Subject Code : AE-308**  
**Paper ID : [A0722]**

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTION TO CANDIDATES :**

1. **SECTION-A is COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students has to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students has to attempt any **TWO** questions.

**SECTION-A****1. Write briefly :**

- a) Define degree of freedom.
- b) What is forced vibration?
- c) Define critical speed.
- d) What is meant by single degree of freedom system?
- e) Explain tractive effort.
- f) Define understeer.
- g) What do you understand by roll axis?
- h) What is rising rate characteristics of rubber spring?
- i) What is dynamic unbalance?
- j) What is turning circle?

**SECTION - B**

2. A car having mass of 2000 kg deflects its spring 4 cm under its own load. Find the natural frequency in vertical direction.
3. What do you understand by orthogonality of mode shapes? Discuss.
4. Discuss different sources of vibration in a vehicle.
5. Explain the possible side forces experienced by the vehicle.
6. A car using rack and pinion type steering gear has steering wheel of 300mm diameter and pinion with 5 teeth of 10 mm pitch. Determine the effort required by each hand at the steering wheel to overcome a load of 600 N at the rack.

**SECTION - C**

7. 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 sinewave whose amplitude is 80 mm and the wavelength is 14 m. Find the amplitude of vibration at a speed of 60 km/hr.
8. A car having wheelbase of 2.44 m and pivot centre of 1.12 m has a track of 1.22 m between centers of tyre tread. If the angle of lock is  $30^\circ$  and the width of tyre is 0.114 m, determine the minimum radius of outer turning circle.
9. Write a note on Rayleigh upper bound method.