



# AJEENKYA

## D Y PATIL UNIVERSITY

---

### End Term Examinations (December 2018)

School: Engineering

Program: M.Tech Automotive Product Engineering

Course: Conceptual Design

Course Code: APE502

Semester: I

Max Marks: 40

Duration (mins): 120

---

**Answer ALL the questions.**

- Q 1. Derive the equation for free and forced vibration for single degree of freedom for  
i) Under damped conditions ii) Over damped conditions iii) Critically damped conditions.

OR

**(08)**

Derive the suitable expression to find out the reaction forces, Maximum tractive effort and maximum forward acceleration for (i) Four wheel drive (ii) Front wheel drive (iii) Rear wheel drive

- Q 2. Write about the stability of a vehicle on a slope.

A vehicle of total weight 50 kN is held at rest on a slope of 10 deg. It has a wheel base of 2.25 m and its CG is 1.0 m in front of the rear axle and 1.5 m above the ground level. Find the normal reaction at the wheel.

OR

**(10)**

The vibration of a cantilever is given by  $y = A \{1 - \cos (\pi X/2L)\}$ . Calculate the frequency of the cantilever using Rayleigh's methods. Cross section of the beam is circular of diameter of 50 mm, length of beam as 3 m. Take Young's modulus as 200 GPa, Mass of the shaft as 50 kg.

Q 3. Write a brief note on vibration measurement using Transducers and Exciters. Explain any 2 transducers along with the working principal and application. Describe the working principal of Electro-dynamic vibration exciter.

OR

**(12)**

Write a note on vibration measurement using Signal Analysis and Time frequency domain analysis.

Q 4. Write notes on any 2 of the following:

**(10)**

- a. Vibration reduction using isolator and shock absorbers
- b. Damped free vibration and types of damping in single degrees of freedom system
- c. Natural frequencies and mode shapes (eigenvalues and eigenvectors)
- d. Interior and exterior noise source of the vehicles and its effect on vehicle performance