



End Term Examination (December 2019)

School: School of Engineering

Program: M.Tech Automotive
Product Engineering

Course: Conceptual Design

Course Code: APE502

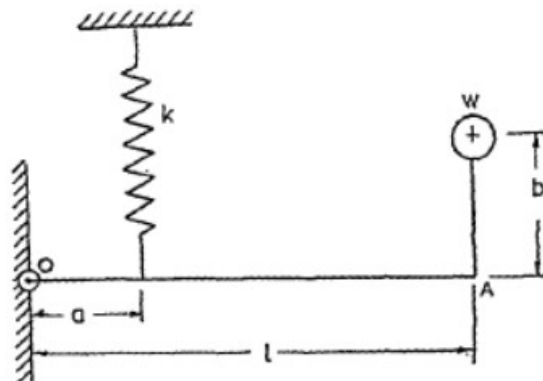
Semester: I

Max Marks: 40

Duration (mins): 90

A. Answer any THREE questions from the following: (30)
(Each question carries 10 marks)

1. The damped vibration record of a spring-mass-dashpot system has the following data: Amplitude on second cycle = 0.012 m; Amplitude on third cycle = 0.0105 m; Spring constant $k = 7840$ N/m; Mass $m = 2$ kg. Determine the damping constant, assuming the system to be viscous.
2. a. Determine the differential equation of motion for the system shown in figure below, where the moment of inertia of the mass M and the bell crank lever about O is J_0 . What is the time period of vibration of this system in the vertical plane? Is there any limitation on the value of b ?



- b. Show that for finding the natural frequency of a spring-mass system, the mass of the spring can be taken into account by adding one-third of its mass to the main mass.
3. Write a detailed note on vibration measurement using Signal Analysis and Time frequency domain analysis.
4. Write a note on vibration measurement using Transducers and Exciters. Explain any two transducers along with the working principle and application. Describe the working principle of Electro-dynamic vibration exciter.

B. Write notes on any TWO of the following: (10)
(Each question carries 5 marks)

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