بسم الله الرحمن الرحيم

King Abdulaziz University
Engineering College
Department of Production and Mechanical System Design

MENG 470 Mechanical Vibrations

First Exam
Closed-book Exam
Monday: 8/2/1425 H
Time Allowed: 60 mins

Name:	Sec. No.:	ID No.:

Question 1		10
Question 2		10
Question 3		10
Question 4		10
TOTAL		40

Instructions

1. There are totally 4 problems in this exam.
2. This is a closed book and closed notes Opportunity to Shine
3. Show all work for partial credit.
4. Assemble your work for each problem in logical order.
5. Justify your conclusion. I cannot read minds.

Q1. Figure.1 shows the free response of a vibration system to an initial displacement. If the mass is 5 kg, determine all possible characteristics which describe the vibration of the system as following:

a) Initial conditions
b) Damping ratio
c) Damping period
d) Undamped and damped natural frequencies
e) Spring constant
f) Damping constant

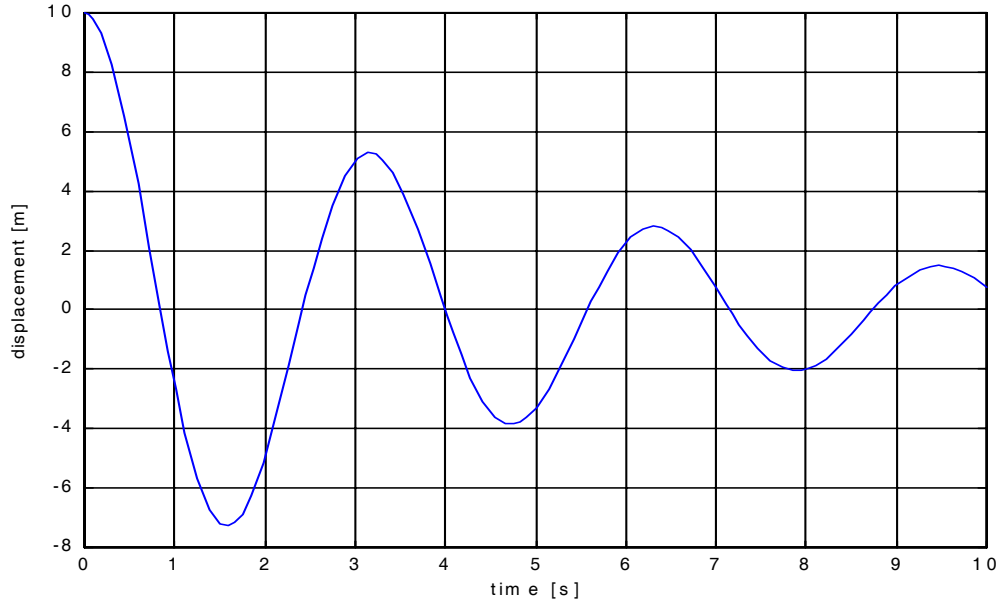

Figure.1

Q2. The system shown in Figure.2 has a natural frequency of 5 hz for the following data:

m = 10 kg, J_0=5 kg-m^2, r_1 = 10 cm, r_2 = 25 cm. When the system is disturbed by giving it an initial displacement, the amplitude of free vibration is reduced by 80 percent in 10 cycles.

Determine the values of k and c.

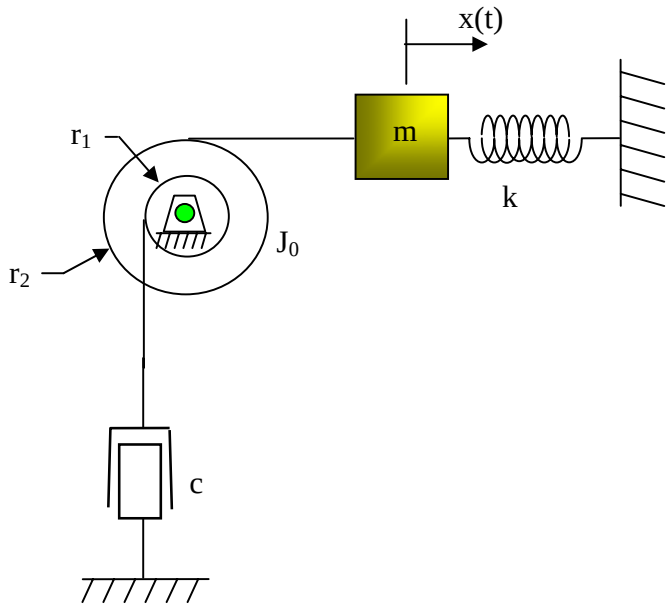

Figure.2

Q3. An unknown mass, *m*, attached at the end of an unknown spring, *k*, has a natural frequency of 95 Hz. When a 0.5 kg mass is added to *m*, the natural frequency is lowered to 75 Hz. Determine the mass, *m* (kg), and the spring constant, *k* (N/m).

Q4. Figure.3 represents a simplified arrangement for a spring-supported vehicle traveling over a rough road. Determine an equation for the amplitude of motion for *m* as a function of road speed. What is the worst road speed?

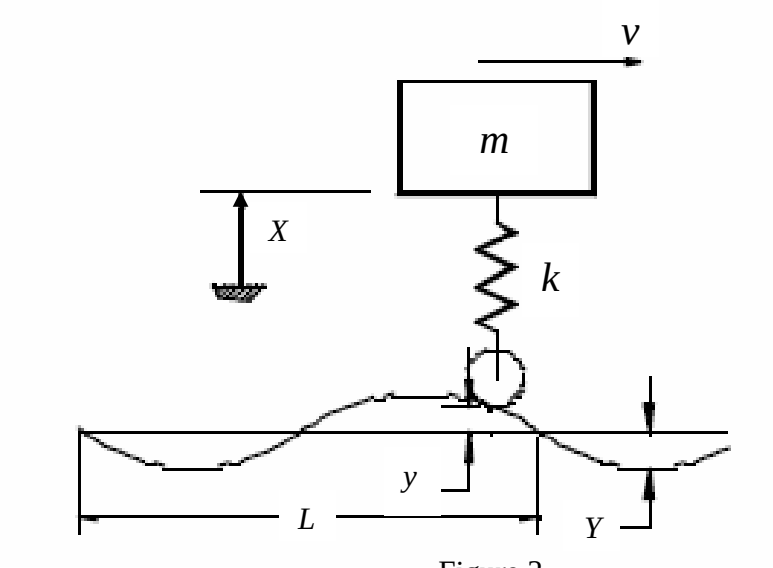

Figure.3