Online Test 1

1. Academic Integrity - Code of Conduct

UCLA is a community of scholars committed to the values of integrity. In this community, all members including faculty, staff, and students alike are responsible for maintaining the highest standards of academic honesty and quality of academic work. As a student and member of the UCLA community, you are expected to demonstrate integrity in all of your academic endeavors. When accusations of academic dishonesty occur, the Office of the Dean of Students investigates and adjudicates suspected violations of this student code. Unacceptable behavior include cheating, fabrication or falsification, plagiarism, multiple submissions without instructor permission, using unauthorized study aids, facilitating academic misconduct, coercion regarding grading or evaluation of coursework, or collaboration not authorized by the instructor. Please review our campus' policy on academic integrity in the UCLA Student Conduct Code: http://www.deanofstudents.ucla.edu/Student-Conduct-Code

If you engage in these types of unacceptable behaviors in our course, then you will receive a zero as your score for that assignment. If you are caught cheating on an exam, then you will receive a score of zero for the entire exam. These allegations will be referred to the Office of the Dean of Students and can lead to formal disciplinary proceedings. Being found responsible for violations of academic integrity can result in disciplinary actions such as the loss of course credit for an entire term, suspension for several terms, or dismissal from the University. Such negative marks on your academic record may become a major obstacle to admission to graduate, medical, or professional school.

We cannot make exceptions to our campus' policy on academic integrity, and as we hopefully have communicated effectively here, penalties for violations of this policy are harsh. Please do not believe it if you hear that "everyone does it". The truth is, you usually don't hear about imposed disciplinary actions because they are kept confidential. So our advice, just don't do it! Let's embrace what it means to be a true Bruin and together be committed to the values of integrity.

By submitting my assignments and exams for grading in this course, I acknowledge the above-mentioned terms of the UCLA Student Code of Conduct, declare that my work will be solely my own, and that I will not communicate with anyone other than the instructor and proctors in any way during the exams.

2. Submit a copy of your solutions using this form:

Please upload all work using this form.

The submission uses Google Forms which requires you to be signed into a Google account and will send a confirmation email when the form and your uploads are successfully submitted. If you do not receive a confirmation email or have any other issues please email support@kudu.com. There are free apps that allow you to use your phone camera to scan to PDF or you can use a printer with a scanner. If you are not able to do this you can take photos of your work with your phone and upload them directly or email the files to yourself, download them on your computer then upload them with the Google Form. You can upload up to 10 images at a time.

If the work you submit via the form is correct, or very nearly correct, I may opt to give you a point back where Kudu would otherwise mark you as wrong, which is why it is important to submit your solutions (neatly, organized, and readable) and show all of your work.

Any numbered solutions (not multiple choice problems) on Kudu that do not have accompanying work justifying your answer I may mark as wrong, even if Kudu marks you as correct, which is why it is important to submit your solutions (neatly, organized, and readable) and show all of your work.

When you submit your written solutions via the form, the multiple choice questions need to have the text of the answer in the written work, not just "A, B, C" etc. The reason is that Kudu displays the options in a random order to students, so the letters alone won't mean much.

3. General instructions

- For any technical issues, please contact support@kudu.com They will respond promptly.
- Your numerical answer must be within 5% of the correct answer to be counted.
- The grade will not depend on the number of significant digits you provide.
- You have only one attempt for each problem - make sure the answer you submit is your final answer.
- In all problems, neglect air resistance, unless instructed otherwise.
- Written solutions showing work and all necessary derivations must be uploaded in addition to submission of numerical answers.
- Multiple choice questions need to have the text of the answer in the written work uploaded, not just "A, B, C" etc.

If you have questions during the active exam time, please email me and ALL the lecture TAs ('EBRYANTO SOEMARDY' <esoemardy215@g.ucla.edu>; 'Aaron John Sabu' <aaronjs@g.ucla.edu>; 'Sven Harder' <svenr.harder@gmail.com>; 'Vince Hou' <vincehou05@gmail.com>) and one or more of us will get back to you ASAP. For technical question about Kudu itself, please contact support and support@kudu.com.

Please note the questions below can be edited and changed by your instructor. The printed version is NOT guaranteed to match the online version at a later stage.

Homework Questions

Q1

(1 points)

A mass m_0 is attached to a spring and hung vertically. The mass is raised a short distance in the vertical direction and released. The mass oscillates with a frequency f_0. If the mass is replaced with a mass 16 times as large, and the experiment was repeated, what would be the frequency of the oscillations in terms of f_0?

Select the correct answer

- $\frac{1}{16} f_0$
- $16 f_0$
- $4 f_0$
- $\frac{1}{4} f_0$
- $\frac{1}{32} f_0$

Q2

(1 points)

You want to predict the frequency with which a ball-on-spring system will oscillate. You measure the spring constant to be $58.2\ \mathrm{N/m}$ and use a ball of mass 1.22 kg. What is the frequency f (in Hz)?

Please enter a numerical answer below. Accepted formats are numbers or "e" based scientific notation e.g. 0.23, -2, 1e6, 5.23e-8

Q3

(1 points)

For an oscillating ball on a spring, which statement describes the energy of the system when the spring is at its maximum extension?

Select the correct answer

- The total energy is zero.
- Both the kinetic and potential energy are at their maximum values.
- The potential energy is at its maximum value, and the kinetic energy is zero.
- The kinetic energy is at its maximum value, and the potential energy is zero.

Q4

This question contains multiple parts. Make sure to read all the instructions and answer each part.

Consider the motion of a simple pendulum displaced by a small angle (no damping).

Part a (1 points)

What is the length of a pendulum (on Earth) that has a period of 0.487 s?

Please enter a numerical answer below. Accepted formats are numbers or "e" based scientific notation e.g. 0.23, -2, 1e6, 5.23e-8

Part b (1 points)

The gravitational force on the moon is one sixth the strength as compared to Earth. What is the period of this same pendulum on the Moon?

Please enter a numerical answer below. Accepted formats are numbers or "e" based scientific notation e.g. 0.23, -2, 1e6, 5.23e-8

Q5 (1 points)

For a simple harmonic oscillator, answer yes or no to the following questions:

(a) Can position and velocity have the same sign?
(b) Can position and acceleration have the same sign?
(c) Can velocity and acceleration have the same sign?

Select the correct answer

- ○ No, no, no
- ○ Yes, no, no
- ○ Yes, no, yes
- ○ Yes, yes, yes
- ○ Yes, yes, no

Q6

(1 points)

A simple mass-spring system has spring with spring constant k = 6.66 N/m and a mass m = 0.781 kg. You can assume no damping. What is the resonance (angular) frequency of this system, ω_{res}?

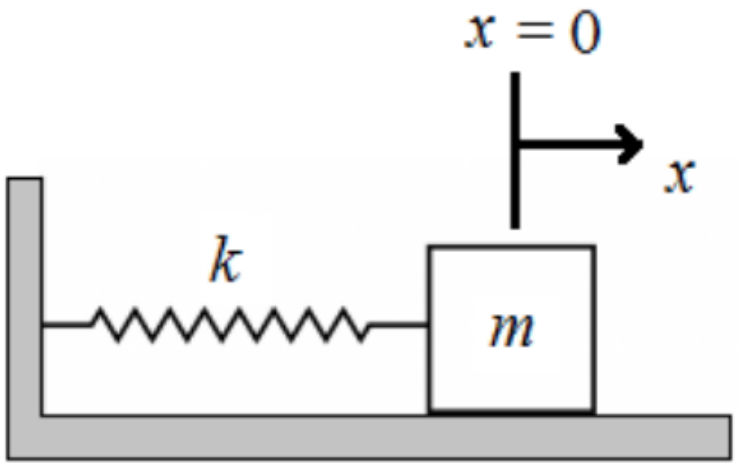
Please enter a numerical answer below. Accepted formats are numbers or "e" based scientific notation e.g. 0.23, -2, 1e6, 5.23e-8

Q7

(1 points)

A 100 g mass attached to a spring moves on a horizontal frictionless table in simple harmonic motion with amplitude 16 cm and period 2 seconds. Assuming that the mass is released from rest at $t = 0$ seconds and $x = -16cm$ cm, find the displacement as a function of time.

Image size: s M L Max



Select the correct answer

- $x = 16cos(\pi t + \pi)$
- $x = -16cos(\frac{\pi t}{\pi})$
- $x = -16cos(2\pi t + \pi)$
- $x = 16cos(\pi t)$

$x = 16cos(\pi t)$

$x = -16cos(\pi t + \pi)$

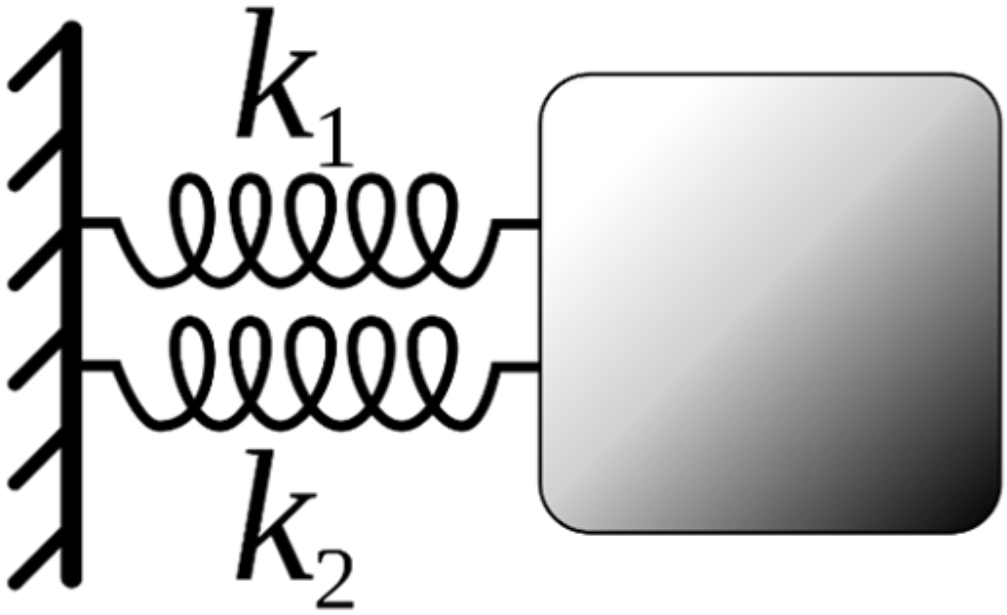
Q8

This question contains multiple parts. Make sure to read all the instructions and answer each part.

Two springs with spring constants k_1 and k_2 are attached to a wall and a block of mass m as shown in the figure. The mass-spring system is displaced a distance x from equilibrium and released from rest.

(Hint: You can ignore gravity assume the only forces on the block are from the two springs.)

Image size: s M L Max



Part a (1 points)

Use Newton's 2nd law to find the correct expression for the acceleration of the block the moment it is released from rest.

(Hint: There are two springs so there are two spring forces and each spring will experience the same stretch when the block is moved away form the equilibrium position.)

Select the correct answer

$a = (\frac{k_1+k_2}{m})x$

- $a = -(\frac{m}{k_1+k_2})x$
- $a = -(\frac{k_1+k_2}{m})x$
- $a = -\sqrt{\frac{k_1+k_2}{m}}x$
- $a = (\frac{m}{k_1+k_2})x$

Part b

(1 points)

The angular frequency of the system will be ...

Select the correct answer

- $\omega = -\frac{m}{k_1+k_2}$
- $\omega = \sqrt{\frac{m}{k_1+k_2}}$
- $\omega = \sqrt{\frac{k_1+k_2}{m}}$
- $\omega = -\frac{k_1+k_2}{m}$
- $\omega = -\sqrt{\frac{k_1+k_2}{m}}$
- $\omega = \frac{k_1+k_2}{m}$

Part c

(1 points)

If k_1 = 3.50 N/m, k_2 = 3.96 N/m, the mass of the block is m = 0.369 kg and the initial displacement of the system is x = 1.10 m, what is the total mechanical energy of the oscillating system when it is set into motion?

Please enter a numerical answer below. Accepted formats are numbers or "e" based scientific notation e.g. 0.23, -2, 1e6, 5.23e-8

Part d

(1 points)

If k_1 = 3.50 N/m, k_2 = 3.96 N/m, the mass of the block is m = 0.369 kg and the initial displacement of the system is x = 1.10 m, what will be the maximum speed of the block?

the system is $x = 1.10$ m, what will be the maximum speed of the block?

Please enter a numerical answer below. Accepted formats are numbers or "e" based scientific notation e.g. 0.23, -2, 1e6, 5.23e-8