

# All Assignments

Use MATLAB wherever possible to work the problem or check your work on a problem. ***Whenever a requested problem asks you to plot or sketch the answer, you must use MATLAB to do your work.***

Treat the homework like a quiz! In other words, don't do the homework with the notes open. Instead, study and learn the material as well as you can, and then try to work the homework problems. If you get stuck, cover up the homework, re-read the notes, and try again.

If you work homework as a group, you **must** identify the group\*.

## Assignment-2

- Reading - Lecture Notes
  - Sections #1 & #2
- Reference - *Tse, Morse, & Hinkle*
  - Chapter 1 - Introduction
  - Appendix A - Matrix Algebra Review
  - Appendix D - Differential Equations Review
- Homework
  - **2-A)** A harmonic displacement is  $x(t) = 6\sin\left(7t - \frac{\pi}{2}\right) \text{ mm}$ , where  $t$  is in seconds and the phase angle in radians. Find:
    - (a) the frequency (in rad/sec and Hz) and the period of the motion (in sec)
    - (b) the maximum displacement, velocity, and acceleration
    - (c) the displacement, velocity, and acceleration at  $t = 0 \text{ s}$
    - (d) the displacement, velocity, and acceleration at  $t = 0.34 \text{ s}$
  - **2-B)** An accelerometer indicates that the acceleration of a body is sinusoidal at a frequency of 3Hz. If the maximum acceleration is  $115 \text{ m/s}^2$ , find the amplitudes of the displacement and the velocity.
  - **2-C)** A table has a vertical sinusoidal motion with constant frequency. What is the largest displacement amplitude that the table can have, if an object on the table is to remain in contact? Explain your answer.
  - **2-D)** A periodic motion is described by the equation,  $x(t) = 10 \sin(2\pi t) + 6 \cos(3\pi t) \text{ in}$ . Plot the motion,  $x$  vs.  $t$ , for  $0 \leq t \leq 4 \text{ s}$ . *Remember to use MATLAB and to properly annotate the plot (x-axis labels, y-axis labels, units, title, etc.)*

---

\* Remember that failure to provide proper reference/citation is called **plagiarism**.

- **2-E)** Plot the motion described by each of the following equations for  $0 \leq t \leq 3 \text{ s}$ .

(Remember MATLAB.):

(a)  $x = 11e^{-1.5t} \sin\left(5\pi t + \frac{\pi}{3}\right) \text{ m}$

(b)  $x = 11 \cos(11\pi t) \text{ m}$

(c)  $x = 11e^{-1.5t} \sin\left(5\pi t + \frac{\pi}{3}\right) + 11 \cos(11\pi t) \text{ m}$

- Selected Answers

- **2-A)** (b)  $v_{\max} = 42 \text{ mm/s}$