

## Alternate 4

**Directions:** Answer the questions below. Then log into CourseWare at <http://www.casa.uh.edu> and submit your answers using the EMCF entitled **Alternate04**. You might need to read section 3.6 and/or watch Monday's video posting to answer the first 10 questions.

**Note:** For questions 1-19, enter either a or b for your response.

1. Newton's second law and Hooke's law are essential to the derivation of the differential equation used to model spring-mass systems.
  - a. True
  - b. False
2. The spring-mass differential equation  $my'' + ky = 0$  results when damping is present, but there is no friction or external force.
  - a. True
  - b. False
3. The external force  $F$  in the spring-mass system  $my'' + \delta y' + ky = F(t)$  can be visualized as a movement of the form  $\frac{1}{k}F(t)$  in the end opposite from the mass, as the mass moves.
  - a. True
  - b. False
4. The spring-mass differential equation  $my'' + ky = 0$  results when no damping or external forces are present.
  - a. True
  - b. False
5. Solutions of the spring-mass differential equation  $my'' + ky = 0$  are always periodic.
  - a. True
  - b. False
6. Solutions of the spring-mass differential equation  $my'' + ky = 0$  can always be written in the form  $A \sin(\omega t + \phi_0)$  for some constants  $A$  and  $\phi_0$ .
  - a. True
  - b. False
7. The equation  $25y'' + 10y' + 5y = 0$  is
  - a. Under damped
  - b. Critically damped
  - c. Over damped
8. The equation  $25y'' + 30y' + 5y = 0$  is
  - a. Under damped
  - b. Critically damped
  - c. Over damped

9. The equation  $450y'' + 30y' + 5y = 0$  is
- Under damped
  - Critically damped
  - Over damped
10. Bridges and other structures can become unstable when the natural vibrations of the system are not sufficiently damped and external forces match the period of the vibrations.
- True
  - False
11. The general solution to  $y''' - 2y'' + 3y' + y = 0$  can be found by finding the roots of  $r^3 - 2r^2 + 3r + 1$ .
- True
  - False
12. A particular solution to  $y^{(4)} - y = \sin(x) + 2e^{-2x}$  can be found in the form  $A\cos(x) + B\sin(x) + Ce^{-2x}$ .
- True
  - False
13. The Laplace transform is a linear transformation.
- True
  - False
14. The Laplace transform of the product of two functions is always the product of the Laplace transforms of the functions.
- True
  - False
15. It is possible to find the Laplace transform of a solution to a linear, constant coefficient initial value problem without actually finding the solution.
- True
  - False
16.  $L[y'(x)] = y(0) + sL[y(x)]$
- True
  - False
17.  $L[5e^{-7x}] =$
- $\frac{5}{s-7}, s > 7$
  - $\frac{5}{s+7}, s > 7$
  - $\frac{5}{s-7}, s > -7$
  - $\frac{5}{s+7}, s > -7$
  - None of these.

18. A table of Laplace transform formulas will be provided on the midterm exam.
  - a. True
  - b. False
19. A review problem set for the midterm exam is posted on the course homepage.
  - a. True
  - b. False
20. The answer is 1.235.