

NAME:
AME 20214
Introduction to Engineering Computing
Examination 1
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1. (5) Write a short `html` script which builds a page that gives a link to the Notre Dame home page: `http://www.nd.edu`.
2. (5) Write `LATEX` script which generates the following equations with the given format:

$$\begin{aligned}\frac{dy}{dt} &= -y, \\ y(0) &= 1, \\ y(t) &= e^{-t}.\end{aligned}$$

3. (10) Give the output of the following `Fortran` statements:
 - (a) `print*, 1..4`
 - (b) `print*, 2/4*2`
 - (c) `print*, 2/4.*2`
 - (d) `print*,2./4.+2`
 - (e) `print*,2/4+2`
4. (5) Write the base 2 (sometimes known as binary) representation of the integer 21.
5. (10) Write the `UNIX` commands for
 - (a) changing the name of a file named `program.f90` to `new.program.f90`,
 - (b) deleting a file named `program.f90`,
 - (c) listing to the screen the contents of a file named `program.f90`,
 - (d) copying a file named `program.f90` into a file named `new.program.f90`,
 - (e) creating a directory named `newdirectory`.
6. (5) Which languages require a compiler?
 - (a) `Fortran 2003`
 - (b) `MATLAB`
 - (c) `C`
 - (d) `C++`
 - (e) `Microsoft Excel`
7. (15) You are given a text file named `output.txt` containing two columns of numbers. The first column represents discrete values of the variable t , which gives time in units of s. The second column represents corresponding values of the variable y , which gives distance in units of m. Write a short `MATLAB` program which reads the data and generates a continuous plot of y versus t . Use a plotting format recommended for graphs in this course.

TURN THE PAGE!

8. (40) Consider the mass-spring-damper problem

$$m \frac{d^2 y}{dt^2} + b \frac{dy}{dt} + ky = 0, \quad y(0) = y_0, \quad \left. \frac{dy}{dt} \right|_{t=0} = 0, \quad t \in [0, t_{stop}],$$

where y is the position (m), t is time (s), m is the mass (kg), b is the damping coefficient (Ns/m), k is the spring constant (N/m), y_0 is the initial position (m), and t_{stop} is the final time (s). Compose

- (a) an input file named `input.txt` which contains numerical values for $m = 10000$ kg, $b = 10$ Ns/m, $k = 1$ N/m, $y_0 = 1$ m, $t_{stop} = 10000$ s; format the file in an easily understood fashion,
 - (b) a Fortran program named `msd.f90` which
 - i. includes at least three useful comment statements,
 - ii. reads the input data from `input.txt`,
 - iii. reads from the screen the number of time steps n to be employed,
 - iv. uses the forward Euler method to get a numerical estimate of $y(t)$ for $t \in [0, t_{stop}]$.
 - v. writes the output of the estimate for t and $y(t)$ to a file named `output.txt`.
9. (5) Write a short Fortran program which prints to the screen
- Go Irish! Beat Seminoles!**
- Have the program also print to the screen an estimate of the final score.