

**NAME:**

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Introduction to Engineering Computing

Examination 1

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1. (8) Identify if the following statements are valid or invalid Fortran statements, by circling *valid* or *invalid*:

- |                                   |              |                |
|-----------------------------------|--------------|----------------|
| (a) $X = 3.1416 * R^2$            | <i>valid</i> | <i>invalid</i> |
| (b) $X1 = 3.0 * Area$             | <i>valid</i> | <i>invalid</i> |
| (c) $Y = SQRT(ABS(X1 - X2)) ** 2$ | <i>valid</i> | <i>invalid</i> |
| (d) $SQRT(ABS(X1 - X2)) ** 2 = Y$ | <i>valid</i> | <i>invalid</i> |

2. (12) Convert the following mathematical expressions into Fortran code. Assume all variables are real.

(a)  $a^2 - 3ab + 4b^2$      *Answer:*

(b)  $\sqrt{\sqrt{\frac{a-b}{c+4d}}}$      *Answer:*

3. (10) Evaluate the precise numerical value which would be returned by a Fortran program:

- (a)  $1 + 1/2$      *Answer:*  
(b)  $1. + 1./2.$      *Answer:*  
(c)  $10/(1.0 * 3) - 10/3$      *Answer:*  
(d)  $4 ** (1/2)$      *Answer:*  
(e)  $1..8/3..8$      *Answer:*

4. (6) Assume  $x$ , a real variable with `kind = 8` has the value of  $-0.00123456789$  and you execute the command

```
print 13,x
```

How would the output appear for the following statements?

- (a) `13 format('x = ',e11.4)`     *Answer:*  
(b) `13 format(f11.2)`     *Answer:*

5. (10) Locate syntax and run-time errors, if any, in the following:

```
(a) do j=1,9,2
      k = j**2
      print*,k
      j=j+1
      end do
```

*Answer:*

```
(b) real, allocatable::a(m,n)
      read*,m,n
      allocate (a(m,n))
```

*Answer:*

6. (5) In UNIX, identify which command deletes a file.

- (a) `dl filename`
- (b) `rm filename`
- (c) `ls filename`
- (d) `less filename`

7. (5) In UNIX, which command allows you to identify which folder you are in?

- (a) `map`
- (b) `whereami`
- (c) `ls`
- (d) `pwd`

8. (7) Identify, if any, *all* problems, both grammatical, syntactical, and “TeXnical” in the following L<sup>A</sup>T<sub>E</sub>X code segment

```
Our favorite equation is
 $y = mx + b$ ,
where  $y$  is the dependent variable,  $x$  is the independent variable,
m is the slop, and b is the intercept.
```

9. (7) Identify, if any, all errors in the following html script:

```
<html>
This is my home page.
<a href=http://www.nd.edu>Link</a> to Notre Dame.
</html>
```

10. (30) Write a simple **Fortran** code which employs the first order Euler method to approximate a solution to the following ordinary differential equation:

$$\frac{dy}{dt} = \frac{y}{\sin y}, \quad y(0) = 0, \quad t \in [0, 1].$$

Use a step size of  $\Delta t = 0.1$ . You need only *write* the code. You need not give any output! Take care that your code respects all of the underlying mathematics of the problem.