READ ME FIRST

- This is a 70 minute, open notes, open books, open computer exam. Not everybody is expected to complete the test, so use your time wisely.
- Your exam will be graded based on what is submitted with this exam, not what you have on the computer.
- Don’t spend too much time on any one problem.
- Amount of time spent on a problem is not necessarily proportional to the points.
- Scan through the entire test and do the easy problems first.
- If something is not clear, ASK.
- BE NEAT. We cannot give you points for something that we can’t read.
- Write down your assumptions.

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1. **VRML Syntax (20 points)**

   Find all the syntax problems with the following VRML world and correct them.

   ```
   # VRML v2 xyz8
   #Draw a box
   shape{
     Geometry Box {
       size 1 2 3 4
     }
   }
   material Material
     DiffuseColor 0.2 0.3 0.4
   Shape{
     #Draw a cone
     geometryCone {
       height 1.23
     }
   }
   #Transform a cylinder
   Transform
   {
     rotate 1 1 1 1
     translate 0 2 0
     scale 0.1 4 0.1
     geometry Cylinder
   }
   ```
2. **What does this do? (20 points)**
   Sketch the output of the following VRML worlds. Be as precise as possible - draw axes, add labels, etc.
   
   (a) **(5 points)**
   
   ```
   #VRML V2.0 utf8
   
   Transform{
     children Shape{
       geometry Cylinder{ }
     }
     scale 0.1 0.1 5
   }
   ```

   (b) **(5 points)**
   
   ```
   #VRML V2.0 utf8
   
   Transform{
     children Shape{
       geometry Cone{ }
     }
     scale 1 -1 1
   }
   ```
(c) (5 points)
#VRML V2.0 utf8

Transform{
    children Shape{
        geometry Sphere{
        }
        scale -1 -1 1
    }
}

(d) (5 points)
#VRML V2.0 utf8

Transform{
    children Shape{
        geometry Cylinder{
        }
        appearance Appearance{
            texture ImageTexture{
                url "RightArrow.url"
            }
        }
        scale -2 1 1
    }
}
3. **How about this? (20 points)**

Sketch the output of the following VRML worlds. Be as precise as possible – draw axes, add labels, etc.

(a) **(5 points)**

```vrml
#VRML V2.0 utf8
Transform{
    children Shape {
        geometry Cylinder{ }
    }
    translation 0 2 0
    rotation 1 0 0 0.785 #45 degrees
}
```

(b) **(5 points)**

```vrml
#VRML V2.0 utf8
Transform{
    rotation 1 0 0 0.785 #45 degrees
    children Transform{
        translation 0 2 0
        children Shape {
            geometry Cylinder{ }
        }
    }
}
```
(c) (10 points)

```vrml
#VRML V2.0 utf8

Transform{
    rotation 1 0 0 1.57 #90 degrees
    children Transform{
        rotation 0 0 1 1.57 #90 degrees
        scale 1 0.1 2
        children Shape {
            geometry Box{ }
        }
    }
}
```
4. **VRML world 1 (20 points)**

Write the VRML world that would produce the following figure. Be as complete as possible. The axes and labels are not part of the world and are for illustration purposes only. Put comments in your VRML to make it more readable.

![VRML output](image1.png)

![Dimensions of the object](image2.png)

Figure 0.1: VRML output. Figure 0.2: Dimensions of the object.
5. **VRML world 2 (20 points)**

Write the VRML world that would produce the following figure. Be as complete as possible. The axes and labels are not part of the world and are for illustration purposes only. Put comments in your VRML to make it more readable.

![VRML output](image1.png)

Figure 0.3: VRML output.

![Dimensions of objects](image2.png)

Figure 0.4: Dimensions of objects.