Project: Part Design (Day 1 AM)
Time: 3 Hours
Marks: 25 points

Given:
Secondary and Post-Secondary

- CAD files required to perform task (Base Plate and assembly file)
- View and Annotation Guide

1 Task:

Create the following:
Secondary and Post-Secondary

1.1 Design a mounting system for the Humminbird Pirahana Max 4 sonar using the provided CAD files. The assembly and part files must comply with the criteria referenced below:

- Each part must be designed to be efficiently created using Fused Deposition Modeling (FDM) 3D printing techniques.
- The material used to create the parts will be ABS.
- The assembly must have the ability to be rotated 360 perpendicular to the Base Plate (see View and Annotation Guide for more detail).
- The assembly must have the ability to tilt from 0 to 90 degrees from the Base Plate (see View and Annotation Guide for more detail).
- The design must interact with the toothed profile in the assembly to allow incremental tilt adjustments (see View and Annotation Guide for more detail).
- The mounting assembly must not contain more than 22 parts (including fasteners) and the 3D printed parts must not exceed a total combined volume of 45 000 cubic mm. This volume assumes a 100% infill for all printed parts. The assembly must also contain no more than six 3D printed parts.
- 3D printed parts should comply with the 3D printer design guidelines outlines in Appendix A.
- A part library is provided with several 10-24tpi fasteners, washers and nuts. They are freely available for use in your designs but count toward the 22 allowable parts. Do not use any other fastener than the ones provided.
- Include an area to perform wire management through the assembly, this must be incorporated in at least your base mounting component (see View and Annotation Guide for more detail).

1.2 Drawing file

- As shown in the View and Annotation Guide, an exploded view and assembled view with balloons and parts list must be developed on page one.
- As shown in the View and Annotation Guide, page two shall provide view representations showing tilting and rotation motions in at least two descriptive positions for each range of

motion.

- As shown in the View and Annotation Guide, pages three and above shall contain Orthographic and isometric views of each part model that you have designed (six maximum) with overall dimensions for Width, Height and Depth. The individual part annotations must also include a view that indicates the orientation you would select to 3D print the file using the FDM strategy.
- Each part file must include a note that displays the actual volume of the part in mm cubed

1.3 Use a Skills Canada template for final layout and detail drawings.

2 Output:

Secondary and Post-Secondary

- Create a single PDF file of your final drawings requested in the tasks specified above.
- Name your file: ### Day1AM.pdf (### is your unique contestant number.).
- Files using wrong names will be penalized 3 points per file.

3 General:

- Each task throughout the competition is independent from the others.
- DO NOT include any part of your name, school, province/territory in documents, or when naming files and folders being submitted.
- Any file, identified by any part of a competitors' name, school, province/ territory, will not be judged.
- When you have finished working on a specific day, do not close project files or turn off your computer, Judges will view and mark your work on screen as needed.
- Ask the judges before leaving the competition area as the judges may require your assistance accessing your work.

4 Assessment:

Task 1.1 Assembly Drawings

- Mounting system overall design and parameter adherence – 10 points

Task 1.2 Drawing Files

- The annotation and drawing package corresponds with the View and Annotation Guide and provides the detail as requested – 15 points

Appendix A – 3D Printer Design Guidelines

The printers that this competition uses are fuse deposition modeling (FDM) type 3D printers. This means that the part is built up of layers of extruded printer filament. Because the context is to design a part that will be built, there are some design guidelines that should be followed for a successful print.

It should be noted that different printers, and even different configuration of the same printer, can result in different design guidelines. For the purposes of this competition, the following guidelines will be what is used for evaluation.

- Minimum wall thickness of 0.8mm.
- Maximum unsupported overhang of 1mm.
- Maximum bridge span of 20mm.
- Support will be required if an overhang angle is greater than 45 degrees or if a bridge is beyond 20mm. Ideally prints should avoid using support material, but it's not unacceptable to use it.
- If support material is needed, make sure there is enough space to remove it.

Also, here are some time and other pieces of information that may be helpful with the design:

- The material use is ABS plastic, it has a strength in tension (pulling) of roughly 4kg f per square mm.
- The vertical axis of printing will have a layer height between 0.1 and 0.2mm, distances in this axis will become quantized by this layer height.
- 3D printed holes and shafts tend to turn out smaller than designed (connect points on a circle), so if a fastener is meant to fit in a hole, a nominal or loose clearance would work best.
- Outside square corners tend to swell. If parts are meant to fit into other parts, chamfering outer sharp edges will improve the fit.