Test Project

Module 1 Mechanical fabrication

Mechanical Engineering CAD

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Introduction

The project contains the following documents/files:

- Printed task
- Printed drawings of parts or assemblies for modeling
- Supplied files (folder…/M1_GIVEN FILES).

Description of project and tasks

Review the printed drawings, Test Project description and 3D data files, then complete the modelling of two (2) projects involving sheet metal fabrication, welding, frame structures, and piping. You shall then generate the required engineering drawings, animation, and rendered image in accordance with the specified requirements

You have 6 hours to complete these projects.

Instructions to the Competitor

PROJECT 1 – HEABMM-100.iam

Model and Assemble Components

1. Create a sheet metal part template named "Sheet Metal-MA" according to the following requirements. All sheet metal parts in this project shall be created based on this template:
   (a) Create a Sheet Metal Unfold style named "Bend Table" in the Style Editor.
   (b) In the "Bend Table" style, set the "Unfold Method" option to "Bend Table".
   (c) Create bend tables for 1.5 mm and 2.0 mm sheet thicknesses according to the "Flat Pattern Length Reference Table (20+20 Specification)".
2. Based on the supplied drawings, complete the assembly of subassembly HEABMM-01 as follows:
   (a) Based on the supplied drawings, model HEABMM-01-01, HEABMM-01-02, HEABMM-01-03, HEABMM-01-04, HEABMM-01-05, HEABMM-01-06, HEABMM-01-07, and HEABMM-01-08.
   (b) Assemble the modeled parts into the assembly.
   (c) Based on the provided SVG file, create the logo feature on sheet metal part HEABMM-01-03-003. Add necessary connecting features according to the drawings to ensure that the logo feature remains complete after laser cutting.
   (d) Using the drawing provided, create a new position to show the door open at 30 degrees.
3. Based on the supplied drawings, complete the assembly of subassembly HEABMM-03 as follows:
   (a) Add frame parts to subassembly HEABMM-03 according to the supplied drawings.
   (b) Add solid welds to subassembly HEABMM-03 according to the supplied drawings.
4. Based on the supplied drawings, complete the assembly of subassembly HEABMM-04 as follows:
   (a) Create the sheet metal part HEABMM-04-01 according to the supplied drawings, and assemble it into subassembly HEABMM-04.
   (b) Add solid welds according to the supplied drawings.

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5. Based on the supplied drawings, complete the assembly of subassembly HEABMM-05 as follows:
   (a) Create sheet metal parts HEABMM-05-01, HEABMM-05-02, HEABMM-05-03, and HEABMM-05-04 based on the supplied drawings, and assemble them into the subassembly HEABMM-05.
   (b) Based on the supplied DXF file, model HEABMM-05-05.
   (c) Assemble the modeled parts and complete the assembly based on the supplied drawings.
6. Based on the supplied drawing, complete the main assembly HEABMM-100.

NOTES:
1. The sheet metal unfolding rules for all sheet metal parts shall be set as Bend Table, and the unfold method shall also be set as Bend Table.
2. Create the flat patterns for all sheet metal parts.

Create Detailed Drawings

1. On a sheet, create the detailed drawing for HEABMM-01-01-003 and HEABMM-01-03-003 as follows:
   (a) Fully dimension the components.
   (b) Include a flat pattern view.
   (c) Include a bend table, and annotate the unfolded dimensions.
2. On a sheet, create an assembly drawing for HEABMM-01 as follows:
   (a) Choose appropriate views to express the assembling relations.
   (b) Show the door open at 30 degrees.
   (c) Add necessary dimensions.
   (d) Add balloons and a structured part list with three (3) columns—NO., QTY., and PART NUMBER.
3. On a sheet, create the detailed drawing for HEABMM-03 as follows:
   (a) Choose appropriate views to express the assembling relations.
   (b) Add a shaded isometric view.
   (c) Add necessary dimensions and welding symbols.
   (d) Add annotate the volume (in mm^3, and precise to single digits)
   (e) Add balloons and a structured part list with six (6) columns—NO., QTY., PART NUMBER, UNIT LENGTH, TOTAL LENGTH and MATERIAL.
4. On a sheet, create the detailed drawing for HEABMM-04-01 as follows:
   (a) Choose appropriate views to express the assembling relations.
   (b) Add a shaded isometric view.
   (c) Fully dimenison the detailed drawing, add welding symbols, and annotate the weld volume (in mm^3, and precise to single digits).
   (d) Add balloons and a structured part list with three (3) columns—NO., QTY., and PART NUMBER.
5. On a sheet, create an assembly drawing for HEABMM-100 as follows:
   (a) Choose appropriate views to express the assembling relations.
   (b) Add necessary dimensions.
   (c) Add balloons and a structured part list with three (3) columns—NO., QTY., and PART NUMBER.

Create an Animation

1. Create an assembling animation of HEABMM-05 as follows:
   (a) Duration not less than 10 seconds, format as AVI, and resolution as 1024x768.
   (b) Present the assembly process of all parts and components in the subassembly.
   (c) Set up the camera positions and actions using the approach you consider most effective.

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PROJECT 2 – WG-100.iam

Model and Assemble Components

1. Based on the supplied drawings and DWF file, model the frame structure WG-TF.
2. Based on the supplied drawings, use Autodesk Tube & Pipe to create the piping system within subassembly WG-PE.
3. Based on the supplied drawings, complete the main assembly WG-100.

Create Detailed Drawings

4. On a sheet, create the detailed drawing for WG-PE as follows:
   (a) Choose appropriate views to express the assembling relations.
   (b) Add a shaded isometric view.
   (c) Dimension the pipes only, and indicate the volumes of the four (4) different coloured pipes separately.
   (d) Add balloons and a structured part list with three (3) columns—NO., QTY., and PART NUMBER.

5. On a sheet, create the detailed drawing for WG-TF as follows:
   (a) Choose appropriate views to express the assembling relations.
   (b) Add a shaded isometric view.
   (c) Add annotate the volume (in mm³, and precise to single digits)
   (d) Add balloons and a structured part list with five (5) columns— NO., QTY., PART NUMBER, UNIT LENGTH, TOTAL LENGTH and MATERIAL.

Create a Rendered Image

1. Create a rendered image of WG-100 as follows:
   (a) Format as JPG, and resolution as 1920x1080.
   (b) Add appropriate materials to the components;
   (c) Set a proper scene.

Marking Scheme

CRITERION	SUBCRITERION	MARKS		
		Judgement	Measurement	Summary
A1	Sheet Metal Parts and Assemblies	-	5.2	5.2
A2	Frame Parts and Assemblies	-	6.2	6.2
A3	Fabrication Detail Drawings	-	8.8	8.8
A4	Piping modeling	-	2.3	2.3
A5	Presentation	1	1.5	2.5
Total		1	24	**25,00**

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Reference numbers for the welding processes

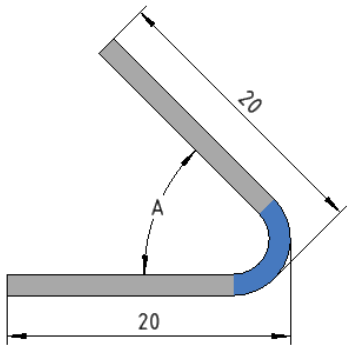
Arc welding	1	Resistance welding	2
Metal arc welding	101	Resistance spot welding	21
Manual arc welding	111	Resistance seam welding	22
Gravity arc welding	112	Lap seam welding	221
Metal arc welding with flux-cored electrode or gas shielded	114	Gas welding	3
Gas shielded metal arc welding	13	Oxy-fuel gas welding	31
Melt Inert-Gas Welding (MIG)	131	Oxy-propane welding	312
Metal Active-Gas Welding (MAG)	135	Oxy-acetilene welding	311
Gas-shielded arc welding with non-consumable tungsten electrode	14	Tungsten Inert-Gas Welding (TIG)	141

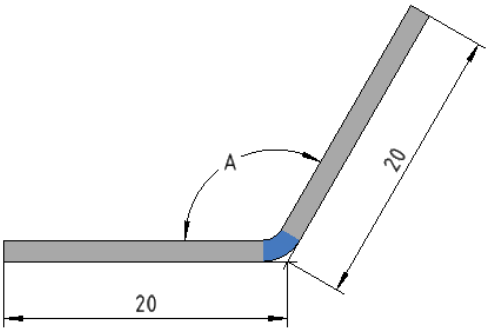
Weld list

CODE	DESCRIPTION
W1	Double-sided fillet weld, 3mm throat thickness, MAG process, 10 locations in total. Welding position in accordance with ISO 6947 and the production process.
W2	Metal arc process, circumferential fillet weld, 3mm throat thickness, 16 locations in total. Welding position in accordance with ISO 6947 and the production process.
W3	Metal arc process, double-sided fillet weld, 2mm throat thickness, 28 locations in total. Welding position in accordance with ISO 6947 and the production process.
W4	Metal arc process, double-sided fillet weld, 2mm throat thickness, 4 locations in total. Welding position in accordance with ISO 6947 and the production process.
W5	Weld between points A and B, 2mm throat thickness, MAG process, 28 locations in total. Welding position in accordance with ISO 6947 and the production process.

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Flat pattern length reference table (20+20 specification)





Thickness	Radius	Open Angle (A)	Developed length
1.5	0.5	90	36.88
	1.5	90	36.46
2	2	30	38.56
		45	37.82
		90	35.67
		125.5	37.79
		135	38.12
		150	38.37
	2.5	30	38.89
		53	37.51
		90	35.46
		127	37.67
		150	38.39

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