[ENG84]

UNIVERSITY OF GREATER MANCHESTER

B.ENG (HONS) MECHANICAL ENGINEERING

SEMISTER 2 EXAMINATION - 2024/2025

GRAPHICAL COMMUNICATIONS AND COMPUTER MODELLING

MODULE NO: AME4065

Date: Tuesday 13 May 2025 **Time: 10:00 – 12:00**

INSTRUCTIONS TO CANDIDATES:

There are FIVE questions.

Answer ANY FOUR questions only. All questions carry equal marks of 25.

Marks for parts of questions are shown in brackets.

Electronic calculators may be used provided that data and program storage memory is cleared prior to the examination.

Computer based exam.

Submission: In Turnitin course submission link by deadline in the form of PDF. The folder of the designs will be collected by deadline.

Parts for assembly and online answer script are available in Moodle

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Q1. The following Figure 1.1 is to be used to answer Questions 1(a-b)

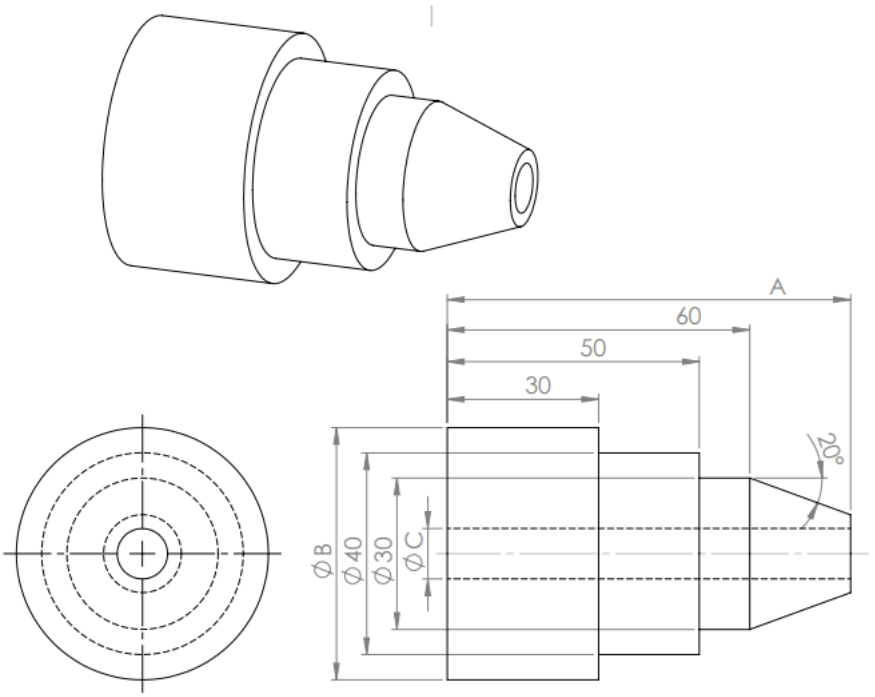

Figure 1.1

Unit systems: MMGS (millimetre, gram, second), decimal places: 2, part original: arbitrary. Brass, Density= 0.0085 g/mm^3. A= 80.00 mm, B= 50.00 mm and C= 10 mm and Part origin: Arbitrary. Note: All geometry is symmetrical about the dotted lines.

a) What is the overall mass of the part (grams)? Explain in brief all the steps to get the final 3D model. You need to provide the Figures of all the Sketches (2D Model), 3D Model, and Mass Properties.

(15 Marks)

b) Change the A, B and C to 85.00 mm, 45.00 mm and 8.00 mm, respectively. What is the overall mass of the part (grams)? You need to provide the Figures of all the Sketches (2D Model), 3D Model, and Mass Properties.

(5 Marks)

Question 1 continues over the page…

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…Question 1 continued

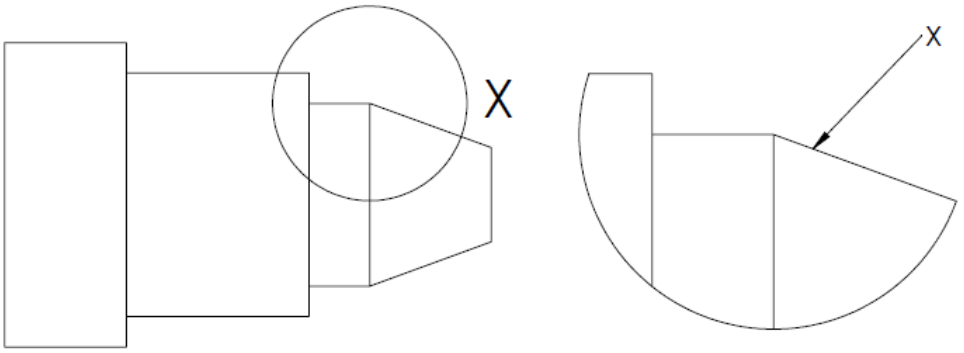

Figure 1.2

c) What is the name of the view indicated by X in the above Figure 1.2?

(5 Marks)

Total 25 Marks

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Q2. The following Figure 2.1 is to be used to answer Questions 2(a-b)

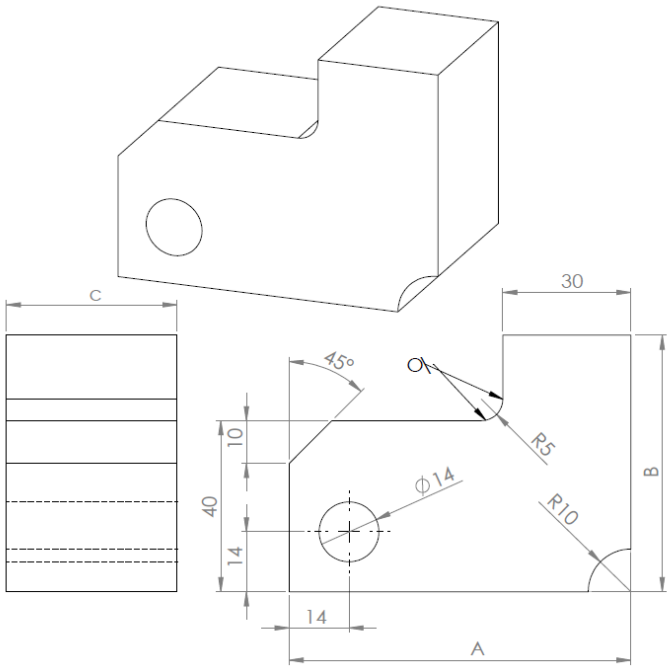

Figure 2.1

Build this part in SOLIDWORKS. Unit system: MMGS (millimeter, gram, second), decimal places: 2, part origin: Arbitrary. All holes through all unless shown otherwise. Material: AISI 304 Steel, density = 0.008 g/mm^3. A = 80.00 mm, B = 60.00 mm and C = 40.00 mm.

REMINDER: Save your part in a different file after each question in case it must be reviewed.

a) What is the overall mass of the part (grams)? Explain in brief all the steps to get the final 3D model. You need to provide the Figures of FeatureManager Design Tree, all the Sketches (2D Model), 3D Model, and Mass Properties.
(15 Marks)

b) Change the A, B, C to 90.00 mm, 70.00 mm and 20.00 mm, respectively. What is the overall mass of the part (grams)? You need to provide the Figures of all the Sketches (2D Model), 3D Model, and Mass Properties. **(5 marks)**

Question 2 continues over the page…

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…Question 2 continued

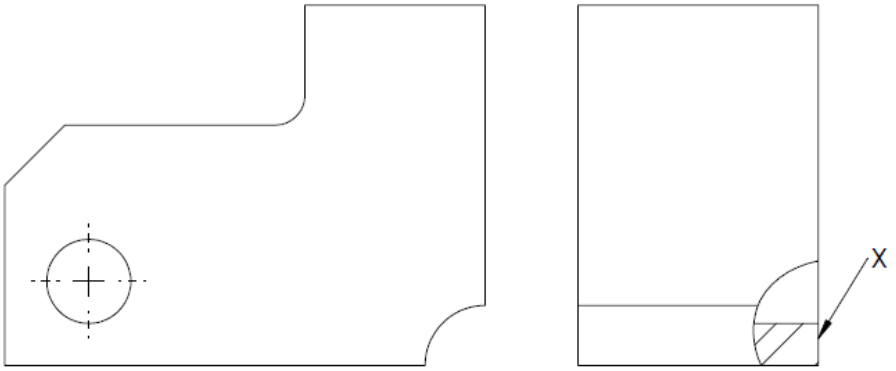

Figure 2.2

c) What is the name of the view indicated by X in the above Figure 2.2?

(5 Marks)

Total 25 Marks

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Q3. The following Figure 3.1 is to be used to answer Questions 3(a-b)

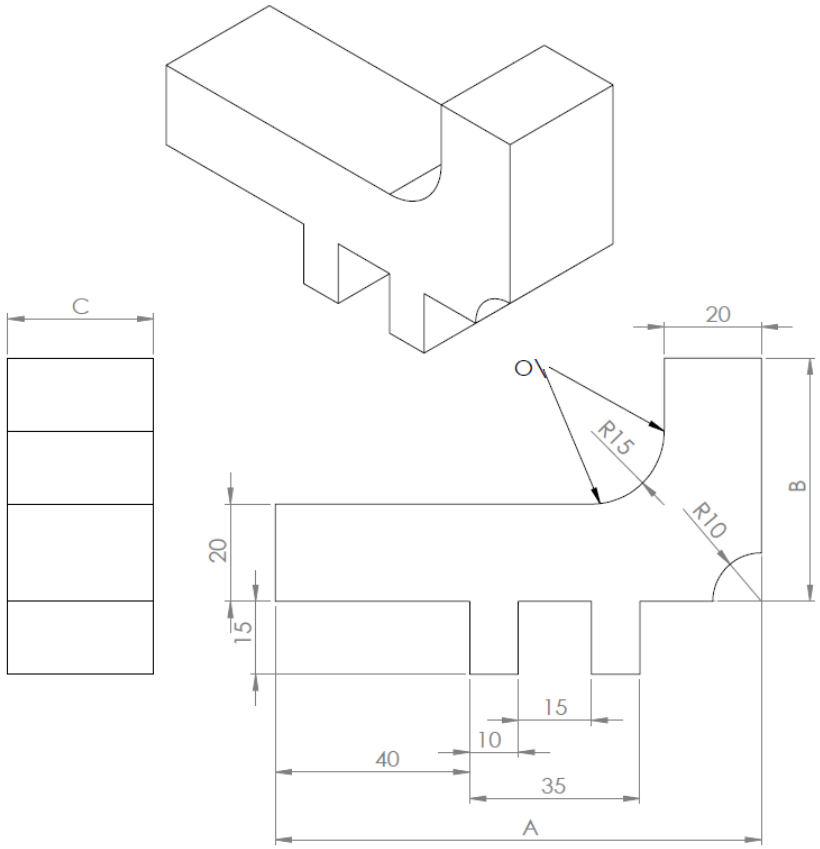

Figure 3.1

Build this part in SOLIDWORKS. Unit system: MMGS (millimetre, gram, second), decimal places: 2, part origin: Arbitrary. Material: 2014 Aluminium Alloy, density = 0.0028 g/mm^3. A = 100.00 mm, B = 50.00 mm and C = 30.00 mm.

REMINDER: Save your part in a different file after each question in case it must be reviewed.

a) What is the overall mass of the part (grams)? Explain in brief all the steps to get the final 3D model. You need to provide the Figures of all the Sketches (2D Model), 3D Model, and Mass Properties.

(15 Marks)

Question 3 continues over the page…

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…Question 3 continued

b) Change the A, B, C to 90.00 mm, 40.00 mm and 40.00 mm, respectively. What is the overall mass of the part (grams)? You need to provide the Figures of all the Sketches (2D Model), 3D Model, and Mass Properties.

(5 Marks)

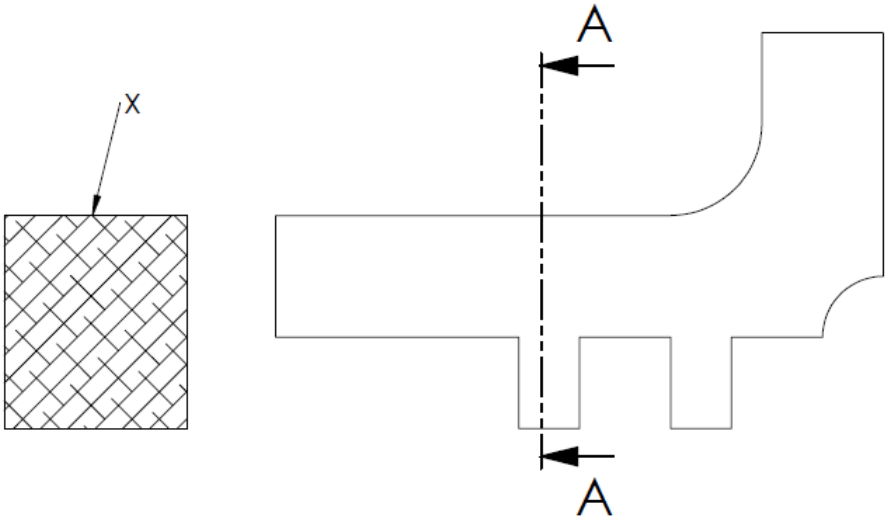

Figure 3.2

c) What is the name of the view indicated by X in the above Figure 3.2?

(5 Marks)

Total 25 Marks

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Q4. The following Figure 4.1 is to be used to answer Questions 4(a-b) where two views of the same model available.

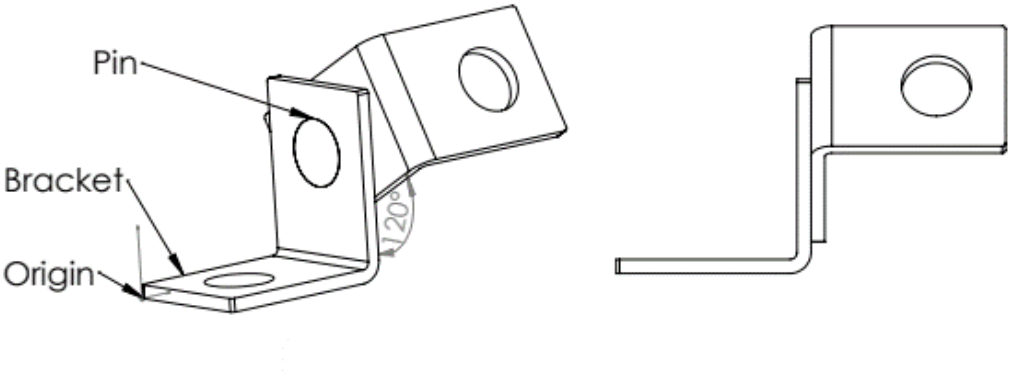

Figure 4.1

Build this assembly in SOLIDWORKS

- **Download the Bracket and Pin provided In Folder 1 and open it.**
- Save the contained parts and open those parts in SOLIDWORKS.
- IMPORTANT: Create the Assembly with respect to the Origin as shown in isometric view. (This is important for calculating the proper Centre of Mass)
- Create the assembly using the following conditions:

It contains 2 machined Brackets and 1 Pin.

Bracket: 2mm thickness, and equal size (holes through-all). AISI 1020 Steel, density = 0.008 g/mm^3.

Pin: 4 mm length and 10 mm in diameter, Material: AISI 1020 Steel, density = 0.008 g/mm^3. Pins are mates concentric to bracket holes (no clearance). Pin end faces are coincident to bracket outer faces. Brackets are positioned directly adjacent to one another with 120° angle mates.

Unit systems: MMGS (millimetre, gram, second), decimal places: 2, assembly origin: as shown in bottom-left corner of the model.

Question 4 continues over the page…

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…Question 4 continued

a) What are the centre of mass (millimeters) and overall mass (grams) of the assembly? Explain in brief all the steps to get the final Assembly model. You need to provide the Figures of Assembly, Feature Manager Design Tree, Part of the tree showing all the mates and Mass Properties.

(15 Marks)

b) In Figure 4.1, Brackets are positioned with angel mates of 120^{o}. Change this angle to 130^{o}. What is the centre of mass of the assembly? You need to provide the Figures of Assembly and Mass Properties.

(5 Marks)

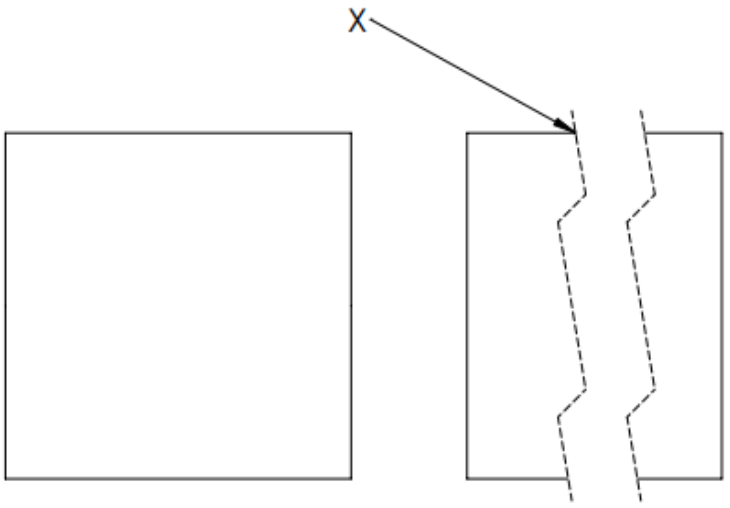

Figure 4.2

c) What is the name of the view indicated by X in the above Figure 4.2?

(5 Marks)

Total 25 Marks

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Q5. The following images are to be used to answer Questions 5(a-b)

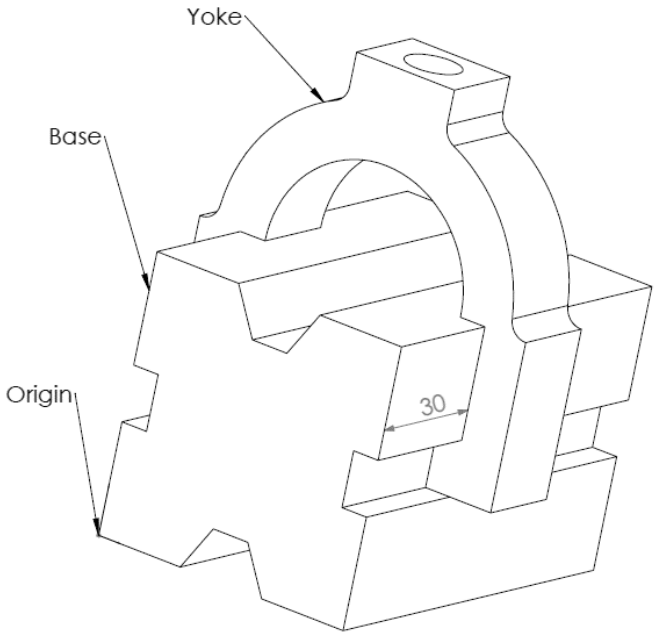

Figure 5.1

Build this assembly in SOLIDWORKS

- **Download the Base and Yoke provided in Folder 2 and open it.**
- Save the contained parts and open those parts in SOLIDWORKS.
- IMPORTANT: Create the Assembly with respect to the Origin as shown bottom-left corner. (This is important for calculating the proper Centre of Mass)
- Create the assembly using the following conditions:

It contains 2 components: Base and Yoke. Apply the MMGS unit system.

Material: 2014 Aluminium Alloy for all components. Density = 0.0028 g/mm^3.

Base: The distance between the front face of the Base and the front face of the Yoke = 30 mm.

Question 5 continues over the page…

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…Question 5 continued

Yoke: The Yoke fits inside the left and right square channels of the Base component, (no clearance).

a) What is the centre of mass of the assembly (millimeters) and overall mass (grams)? Explain in brief all the steps to get the final Assembly model. You need to provide the Figures of Assembly, Feature Manager Design Tree, Part of the tree showing all the mates and Mass Properties.

(15 Marks)

b) In Figure 5.1, the distance between the front face of the Base and the front face of the Yoke is 30 mm. Change this distance to 20 mm. What is the centre of mass of the assembly? You need to provide the Figures of Assembly, Feature Manager Design Tree, Part of the tree showing all the mates and Mass Properties.

(5 Marks)

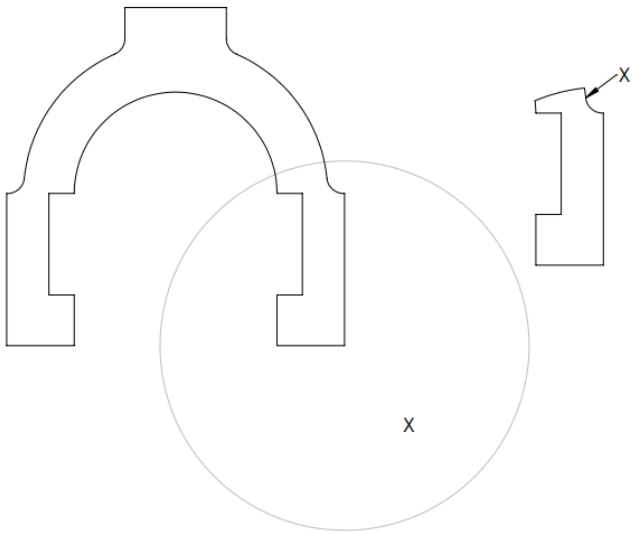

Figure 5.2

c) What is the name of the view indicated by X in the above Figure 5.2?

(5 Marks)

Total 25 Marks

END OF EXAM