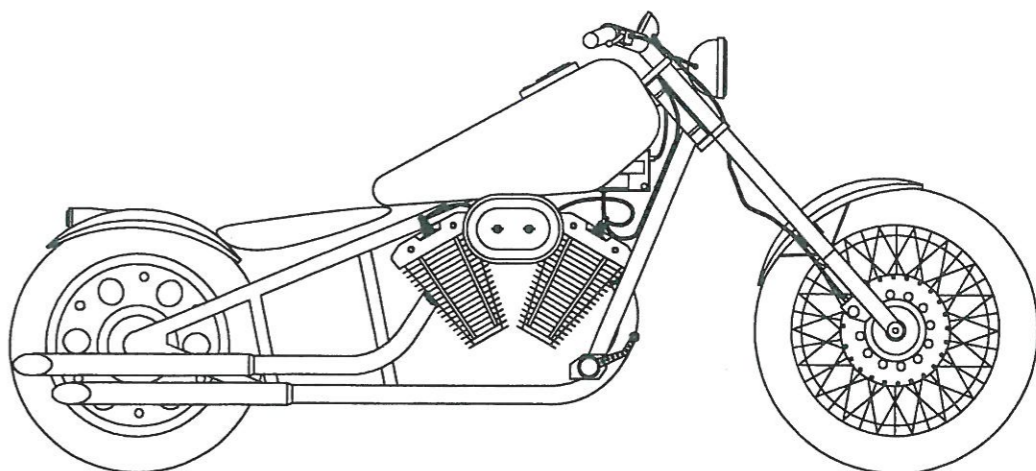




NATIONAL SENIOR CERTIFICATE EXAMINATION  
2012

ENGINEERING GRAPHICS AND DESIGN  
PAPER 2

MARKS: 200  
TIME: 3 HOURS



FOR OFFICIAL USE ONLY					
QUESTION	SECTION	MARK	MODERATED	MAXIMUM	CODE
1	MECHANICAL ANALYTICAL			15	
2a	HELIX			30	
2b	MECHANISM			15	
3	ISOMETRIC PROJECTION			40	
4	MECHANICAL ASSEMBLY			100	
SYMBOL	TOTAL			200	
	TOTAL			100	

FINAL CONVERTED MARK	CHECKED BY
100	

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

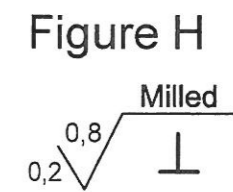
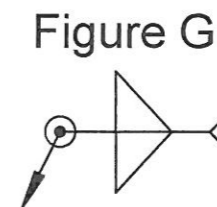
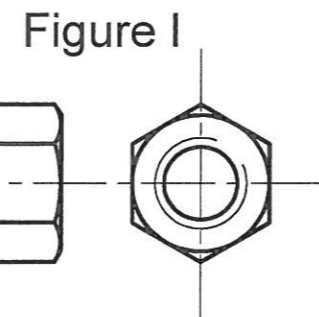
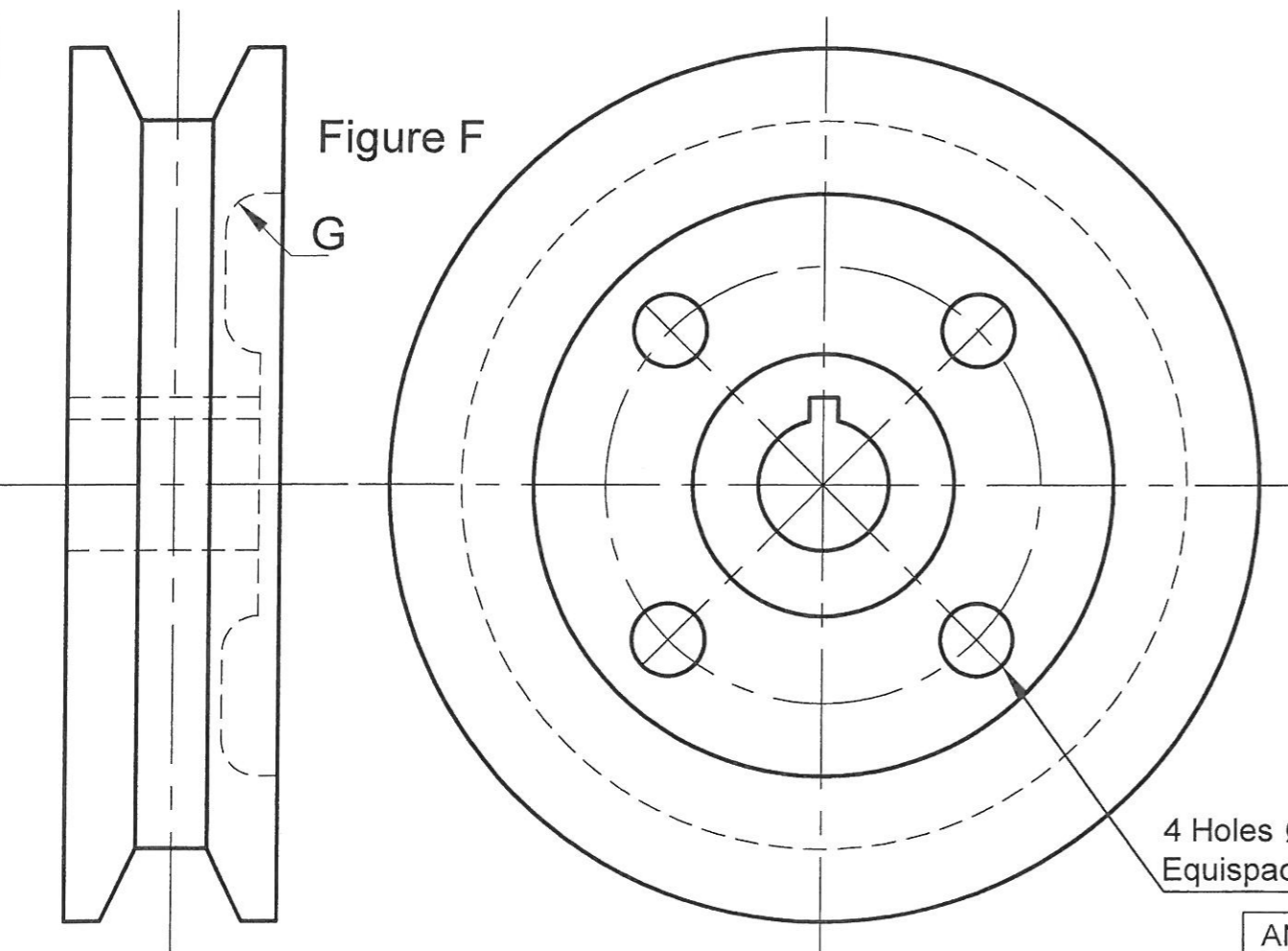
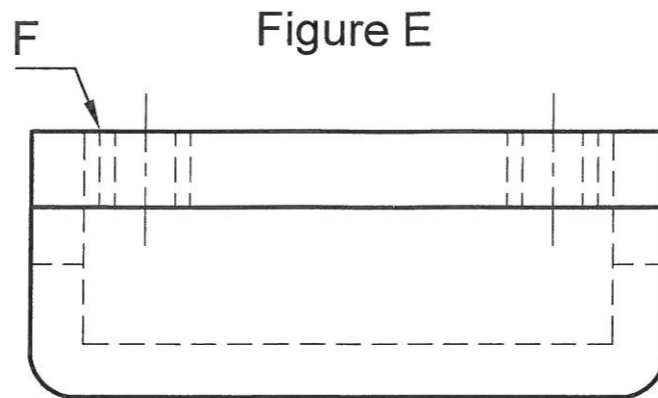
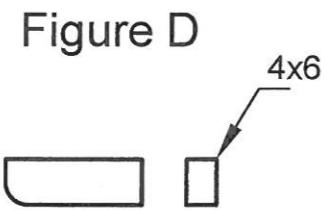
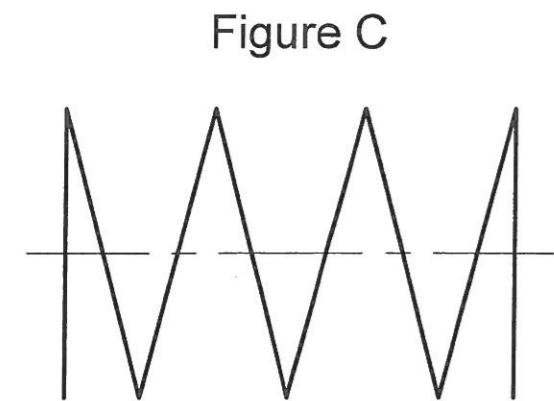
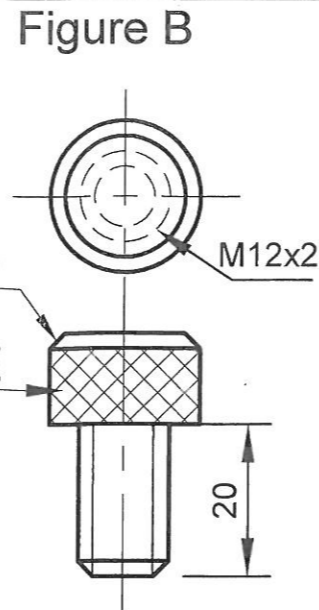
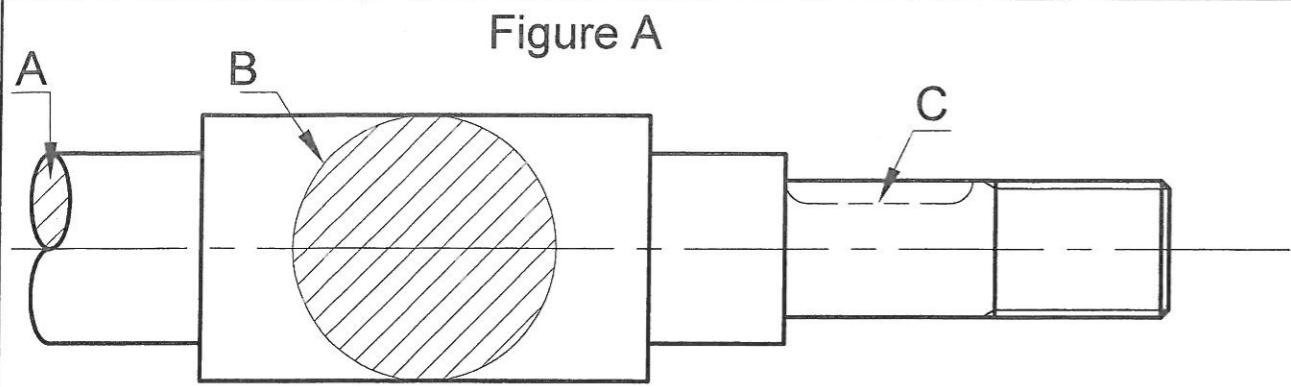
1. This question paper consists of **7 pages** including the cover page and **4 questions**.
2. **All** questions must be answered.
3. Unless specified otherwise, all questions are in **Third Angle Orthographic Projection**.
4. Unless specified otherwise, all questions are to be completed to a **scale of 1:1**.
5. **All** answer sheets must be re-stapled in numerical order, even questions that are not attempted/blank.
6. All **construction work** must be shown, even if a stencil was used.
7. Print your **examination number** neatly on each page.
8. Use only the **drawing sheets** provided.
9. Your drawings should reflect **neatness** and **accuracy**.
10. All dimensions or detail not given may be **assumed** in **good proportion**.
11. **Stencils** may be used.

EXAMINATION NUMBER

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QUESTION 1

MECHANICAL ANALYTICAL



1.1 Choose the correct alternative and write down the **LETTER** in the space provided.

1.1.1 The feature 'A' in Figure A represents a: \_\_\_\_\_ (1)

- A. Revolved section
- B. Removed section
- C. Interrupted view

1.1.2 The feature 'B' in Figure A represents a: \_\_\_\_\_ (1)

- A. Revolved section
- B. Removed section
- C. Interrupted view

1.2 Answer the following questions. Write your answer in the space provided.

1.2.1 The feature 'C' in Figure A represents a \_\_\_\_\_ (1)

1.2.2 The feature 'D' in Figure B represents a \_\_\_\_\_ (1)

1.2.3 The feature 'E' in Figure B represents a \_\_\_\_\_ (1)

1.2.4 What is the thickness of the thread on Figure B? \_\_\_\_\_ (1)

1.2.5 What type of machine part is shown in Figure C? \_\_\_\_\_ (1)

1.2.6 What type of key is shown in Figure D? \_\_\_\_\_ (1)

1.2.7 What type of hole (Feature 'F') is shown in Figure E? \_\_\_\_\_ (1)

1.2.8 The feature 'G' in Figure F represents a \_\_\_\_\_ (1)

1.2.9 What is the value of the Pitch Circle Diameter (Figure F)? \_\_\_\_\_ (1)

1.2.10 What type of weld is represented in Figure G? \_\_\_\_\_ (1)

1.2.11 Determine the following with reference to the machining symbol shown in Figure H:

1.2.11.1 The roughness value \_\_\_\_\_ (1)

1.2.11.2 The direction of lay \_\_\_\_\_ (1)

1.2.12 Is the thread represented in Figure I internal or external? \_\_\_\_\_ (1)

15 MARKS

EXAMINATION NUMBER

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ANSWER SHEET 1

**QUESTION 2a**

**LOCI  
HELIX**

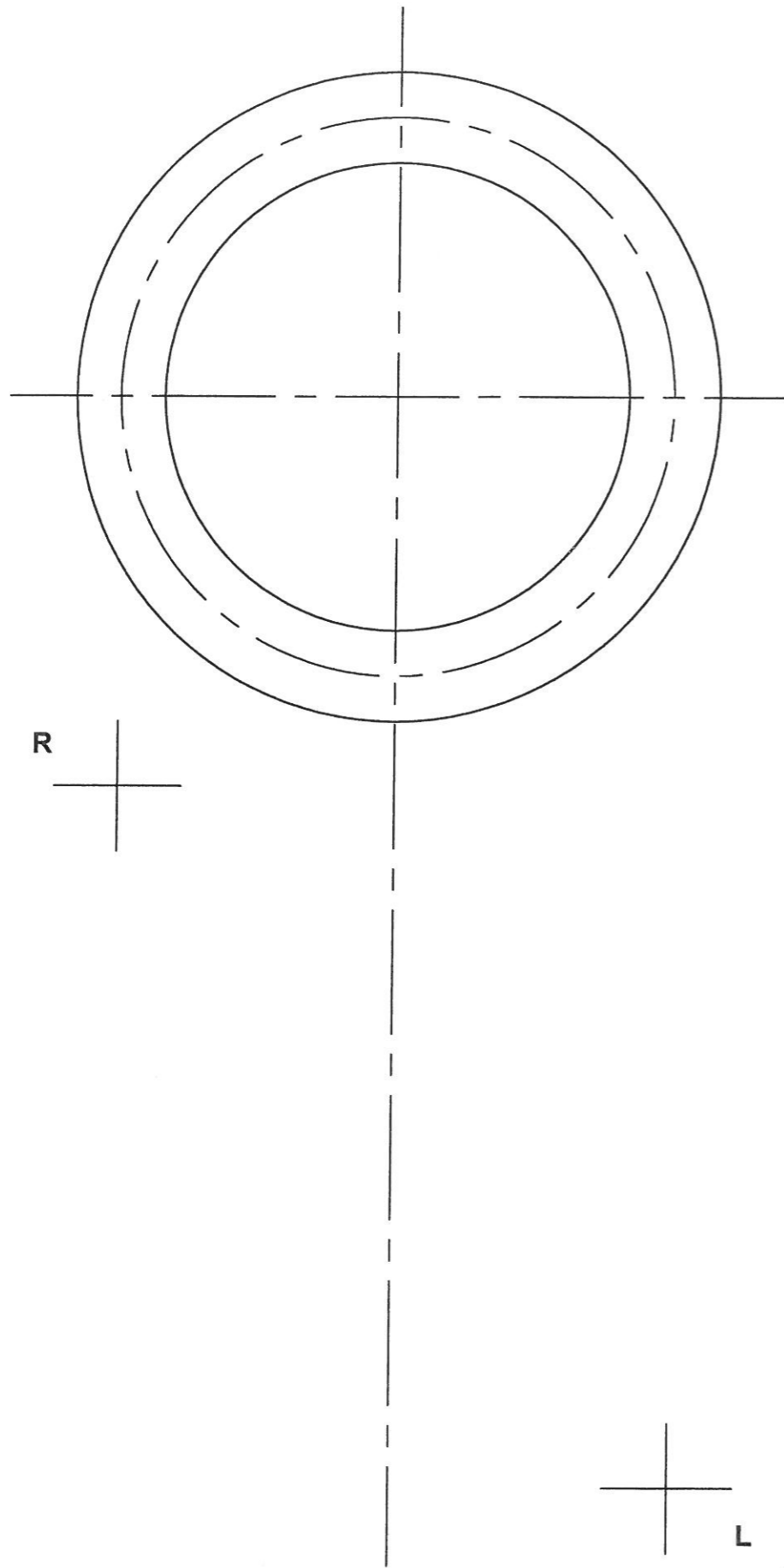
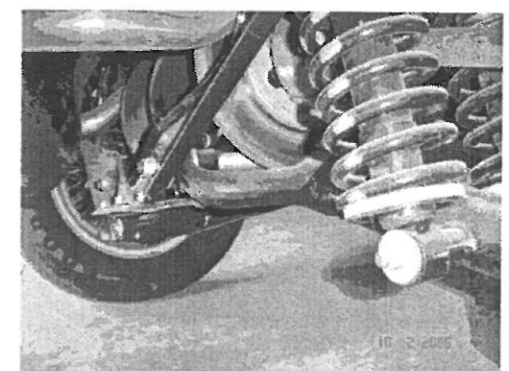


Figure 1 shows a picture of a typical **spring** application. You are given an incomplete front view and an incomplete top view of a circular (coil) spring. Project and draw the spring with the following specifications:

- The direction of turn is right-hand.
- The spring **starts** at **point L** and **ends** at **point R** in **1½ turns**.
- Show all **constructions**.
- Show the **centre line** of the spring.

**ASSESSMENT CRITERIA**

• Set-up	4
• Plot Points	9
• Locus	6
• Hatching	4
• Direction	3
• Centre Line of locus	3
• Top View	1
• LW / ACC / PRE	-2



**FIGURE 1**

SET	<input type="text"/>
PTS	<input type="text"/>
LOC	<input type="text"/>
HAT	<input type="text"/>
DIRE	<input type="text"/>
C/L	<input type="text"/>
TV	<input type="text"/>
L/N/P	<input type="text"/>

**30 MARKS**

**EXAMINATION NUMBER**

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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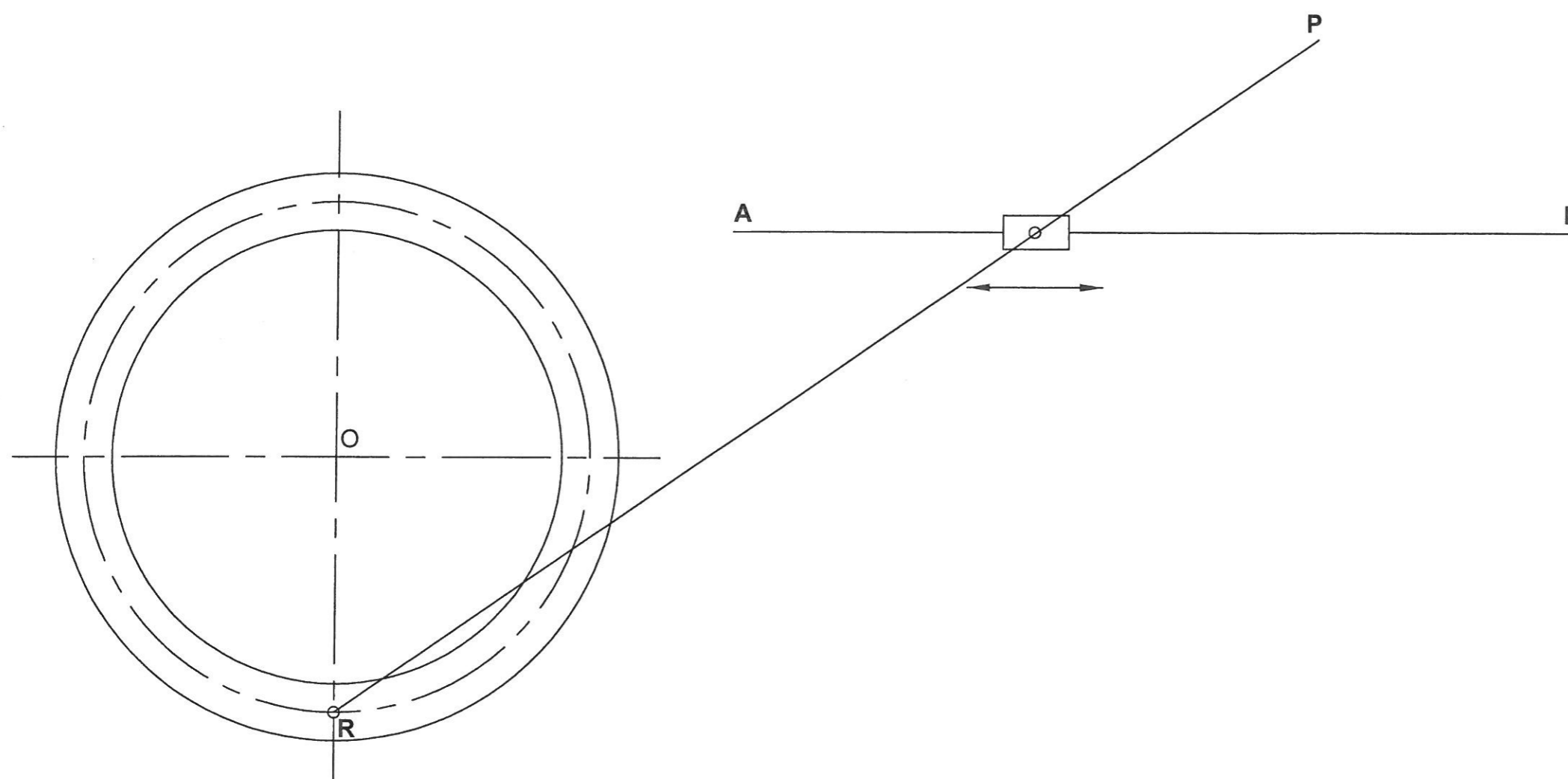
**ANSWER SHEET 2a**

QUESTION 2b

LOCI  
MECHANISM

The given figure shows a wheel, rotating around the centre O, with a **rod** attached to it at point R. The other end of the rod is attached to a **sliding mechanism** that can only move in the horizontal plane between point A and B. Construct and draw the locus of **point P** for one full rotation.

- The direction of rotation is **clockwise**
- Show all **constructions**



<b>ASSESSMENT CRITERIA</b>	
• Set-up	2
• Plot Points	11
• Locus	2
• LW / ACC / PRE	-2

SET	
PTS	
LOC	
L/N/P	

15 MARKS

EXAMINATION NUMBER

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ANSWER SHEET 2b

**QUESTION 3**

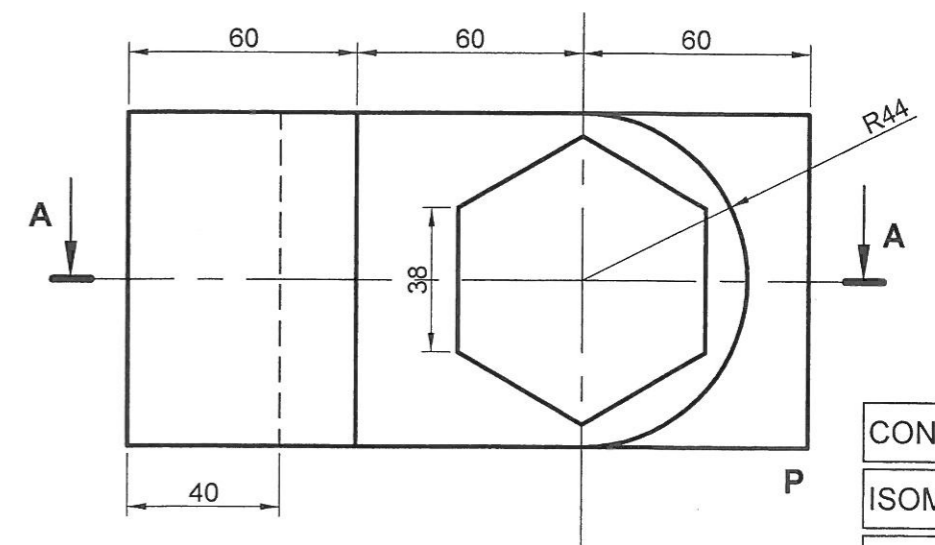
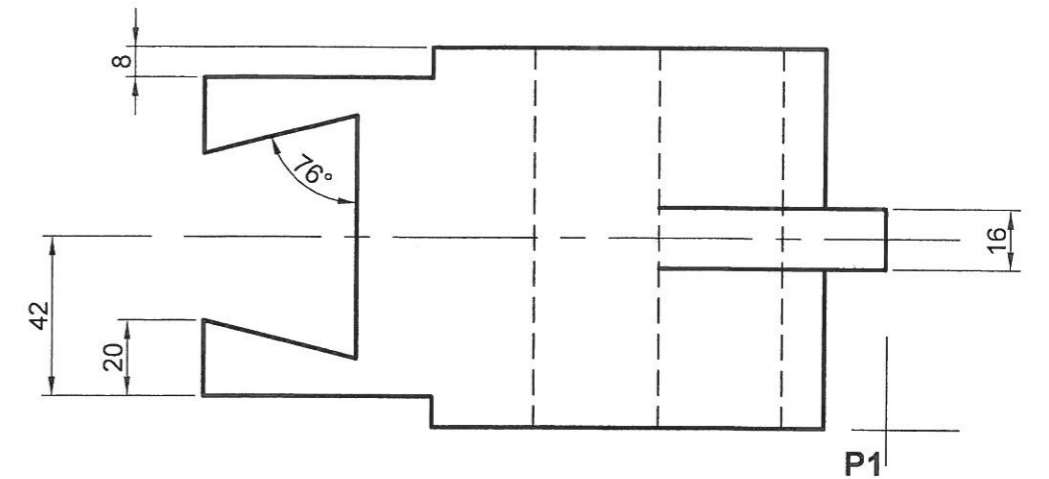
**ISOMETRIC  
DRAWING**

The figure below shows the front view and top view of a heavy duty **CASTING**.

Complete a neat, sectioned **Isometric** drawing using the cutting plane A-A.

Show all **constructions** and **centre lines**.

Make point **P** the lowest point on your drawing and start your drawing on the given crosshairs.



<b>ASSESSMENT CRITERIA</b>	
• Constructions	3
• Isometric Lines	20
• Non-Isometric Lines	5
• Isometric Circles	6
• Centre Lines	2
• Hatching	4
• LW / ACC / PRE	-2

CON	<input type="checkbox"/>
ISOM	<input type="checkbox"/>
N/ISO	<input type="checkbox"/>
CIRC	<input type="checkbox"/>
CLS	<input type="checkbox"/>
HAT	<input type="checkbox"/>
L/N/P	<input type="checkbox"/>

**40 MARKS**

EXAMINATION NUMBER

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ANSWER SHEET 3

QUESTION 4

MECHANICAL ASSEMBLY

FIGURE 1

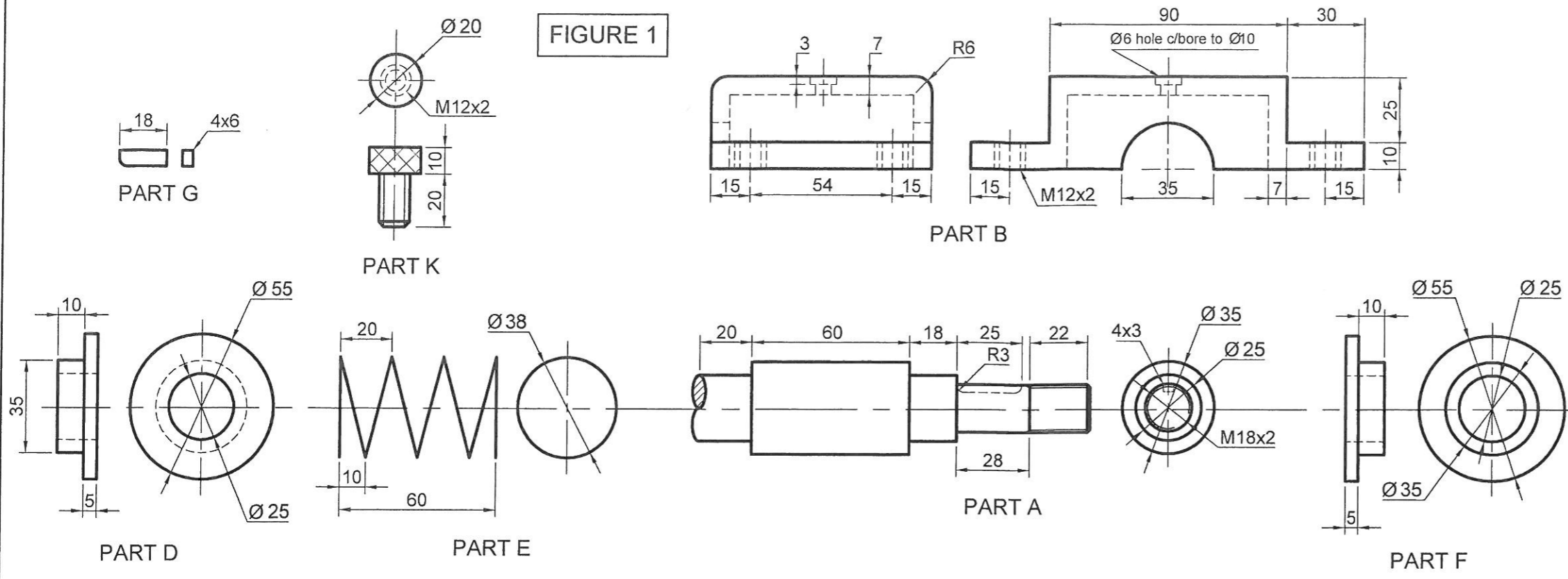
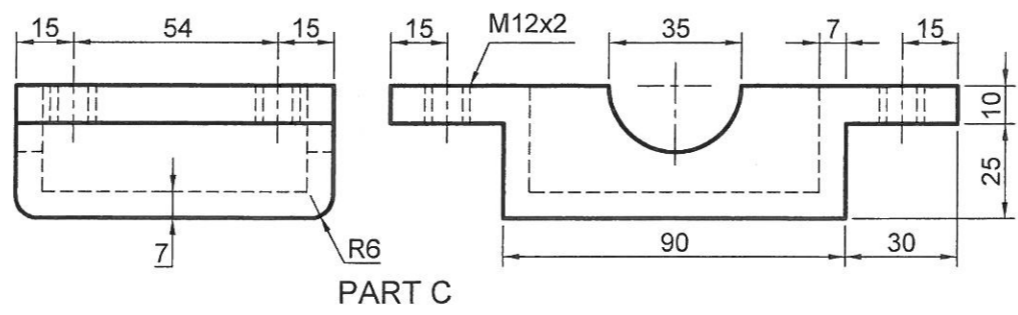
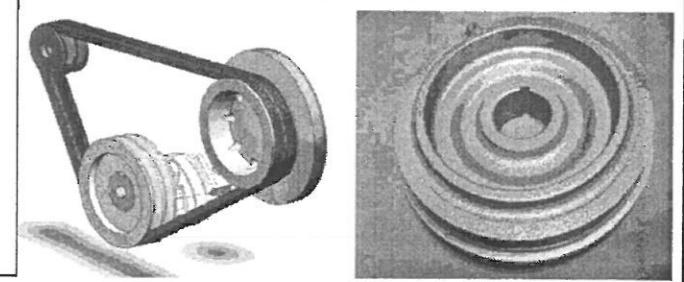


Figure 2 shows a series of pictures of a **PULLEY ASSEMBLY**, as well as an exploded view of how the components of a similar, simplified system are assembled.

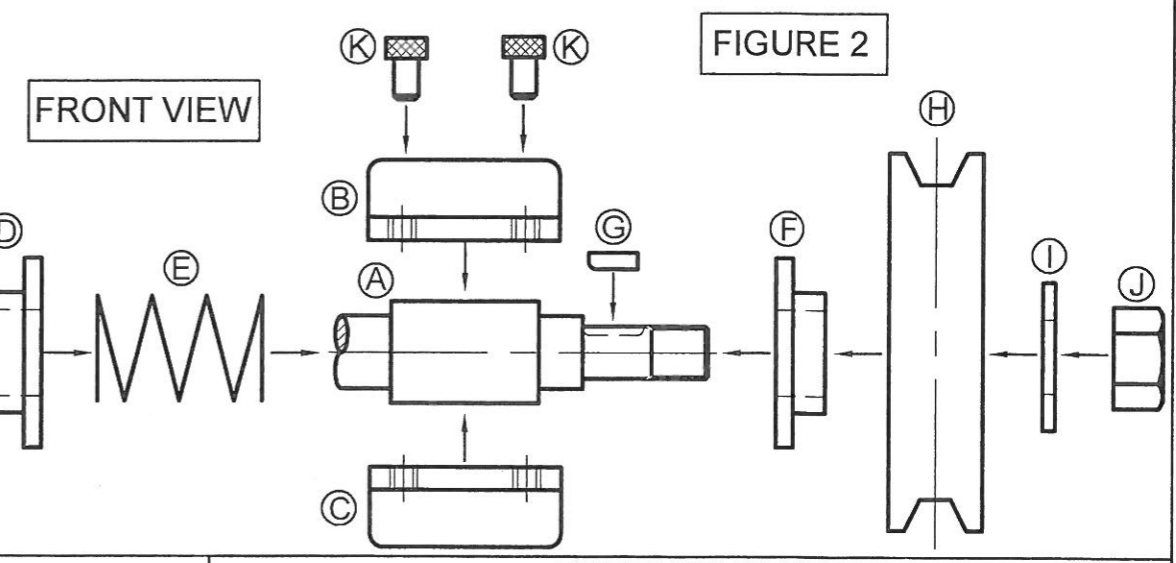
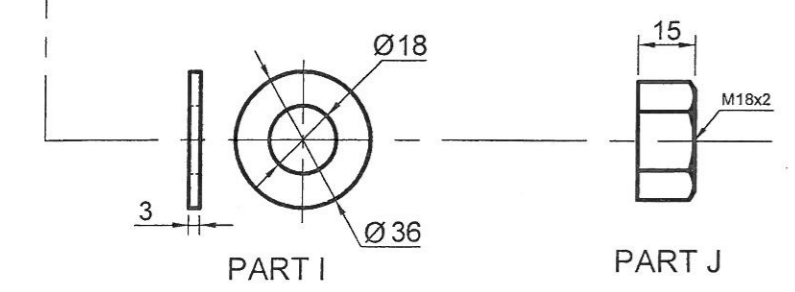
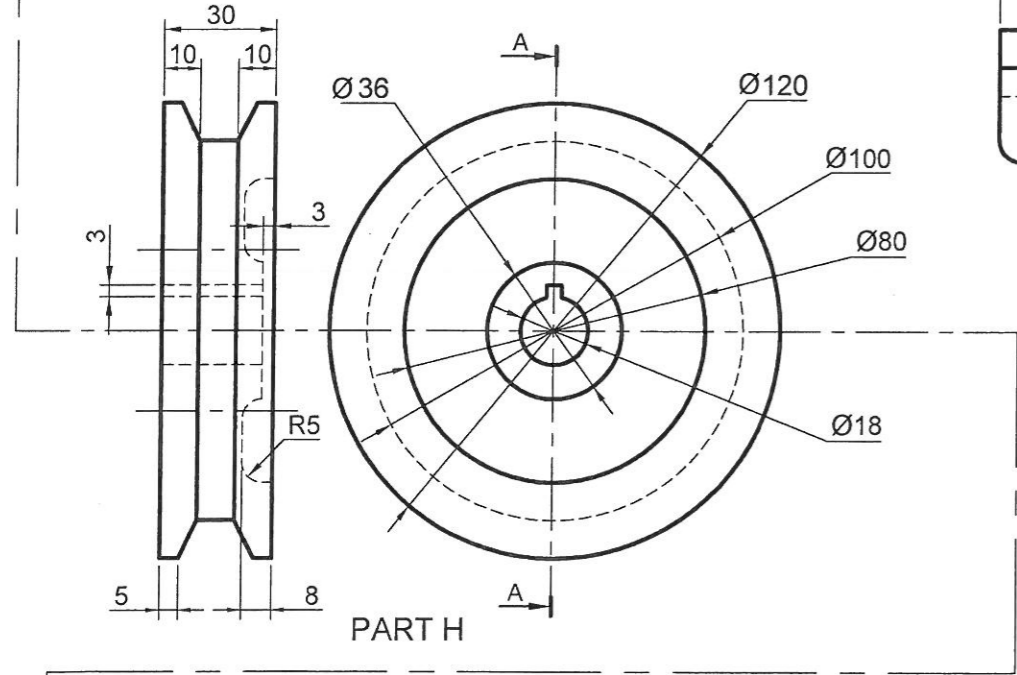
Figure 1 shows the different components that need to be assembled.

Complete the following to a **SCALE** of 1:1:

- 1.1 A **Right View** of the assembled **PULLEY ASSEMBLY**.
- 1.2 A **Sectioned Front View** of the assembled **PULLEY ASSEMBLY** to the cutting plane **AA**. Parts D, E and F are assembled around the shaft before the 2 covers (Part B and Part C) are assembled.
- 1.3 Show **Hidden Detail** on the **Right View** of only the **Pulley** (Part H) and the **tapped holes** of the **Bottom Cover** (Part C). Show your **Section Line** as well as the **Centre Lines**.
- 1.4 Insert 3 important, functional **Dimensions**.
- 1.5 Draw the **Projection Symbol**. (*In the space provided*)
- 1.6 Add a suitable **Title** and indicate the **Scale** used. (*In the space provided*)
- 1.7 Label the **Sectioned View**.



COMPONENT LIST			
NO.	PART	QUANTITY	MATERIAL
A	SHAFT	1	MILD STEEL
B	TOP COVER	1	MILD STEEL
C	BOT COVER	1	MILD STEEL
D	LEFT BUSH	1	COMPOUND
E	SPRING	1	STEEL
F	RIGHT BUSH	1	COMPOUND
G	KEY	1	PEWTER
H	PULLEY	1	ALUMINIUM
I	WASHER	1	MILD STEEL
J	M18 NUT	1	MILD STEEL
K	BOLT	4	MILD STEEL



100 MARKS

EXAMINATION NUMBER

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**QUESTION 4**

**MECHANICAL ASSEMBLY**

**ASSESSMENT CRITERIA**

<b>FRONT VIEW</b>		
A	SHAFT	6
B	TOP COVER	6
C	BOT COVER	4
<del>D</del> / <del>F</del>	BUSHES	6
E	SPRING	2
G	KEY	2
H	PULLEY	8
I	WASHER	1
J	M 18 NUT	4
<b>TOTAL</b>		<b>39</b>
<b>RIGHT VIEW</b>		
A	SHAFT	2
<del>B</del> / <del>C</del>	COVERS	4
H	PULLEY	4
I	WASHER	1
J	M 18 NUT	3
K	BOLTS	4
	HIDDEN DETAIL	7
<b>TOTAL</b>		<b>25</b>
<b>ADDITIONAL</b>		
	CORRECT ASS.	4
	HATCHING	10
	NON-HATCHING	8
	CENTRE LINES	4
	DIMENSIONS	3
	SECTION LINE	2
	SYMBOL	2
	TITLE / SCALE	2
	LABEL	1
	LW / ACC / PRE	-2
<b>TOTAL</b>		<b>36</b>
<b>TOTAL</b>		<b>100</b>

TITLE		SCALE		SYMBOL	
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ANSWER SHEET 4

100 MARKS

EXAMINATION NUMBER											