

2018

MARKS: 200
TIME: 3 HOURS

1. This question paper consists of **6 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 and handed in, even unanswered questions.
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 **answer sheets** provided.
9. Your drawings should be **well presented** and reflect **neatness** and **accuracy**. Marks will be **deducted** for untidy and inaccurate work.
10. All dimensions or detail not given may be **assumed** in **good proportion**.
11. **Stencils** and **calculators** may be used.
12. **All** drawings must adhere to the SANS 1011:1-1.
13. In order to save time, **detailed assembly** parts must be **drawn to convention**.

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QUESTION	SECTION	MARK		MODERATED	MAXIMUM	CODE
1	MECHANICAL ANALYTICAL				20	
2	LOGIC CAM				40	
3	ISOMETRIC DRAWING				40	
4	MECHANICAL ASSEMBLY				100	
TOTAL					200	
SYMBOL					100	

FINAL CONVERTED MARK	CHECKED BY
100	

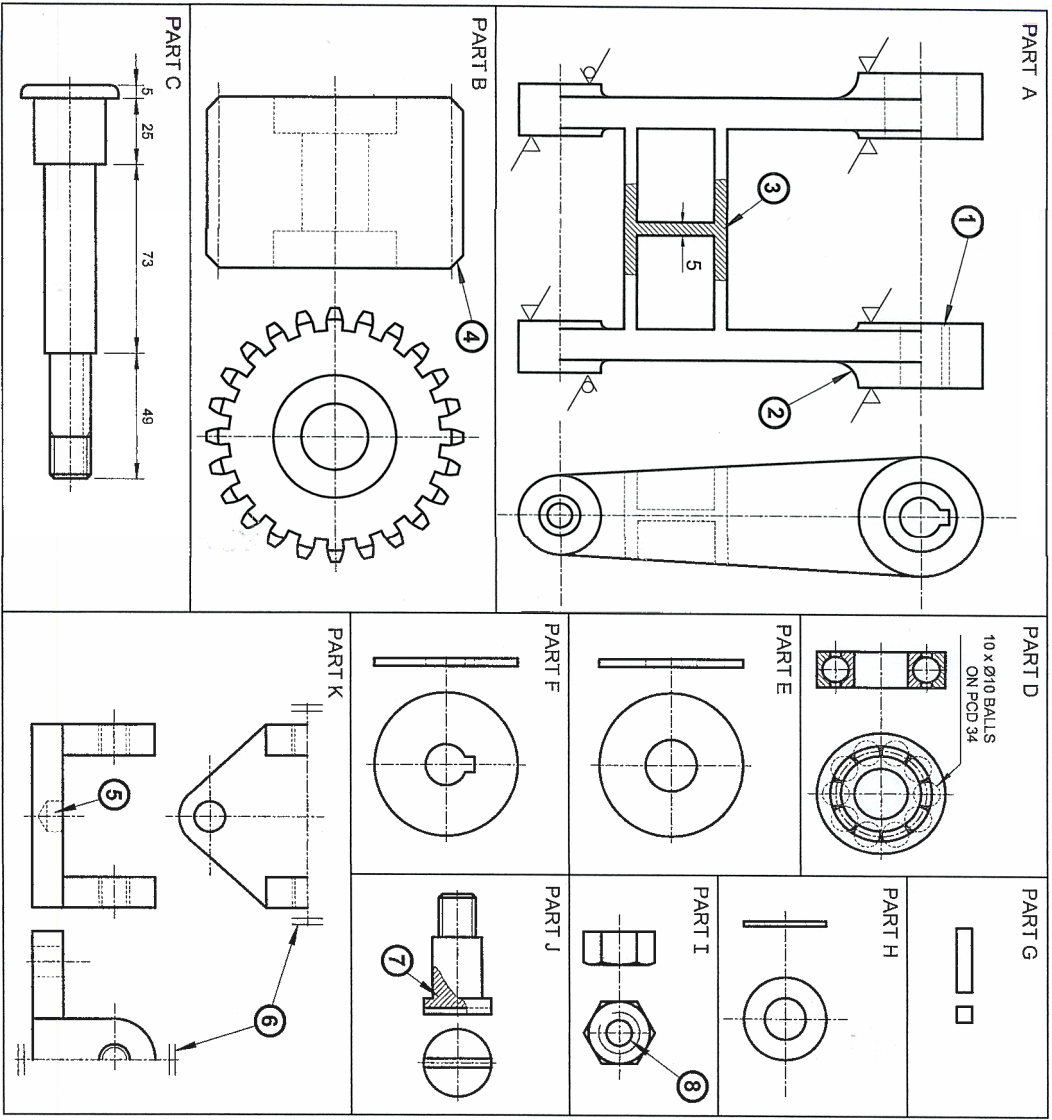
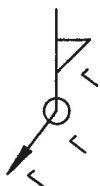
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QUESTION 1
MECHANICAL
ANALYTICAL

STUDY THE ADJACENT DRAWING AND ANSWER THE QUESTIONS THAT FOLLOW:

1.1 What scale is indicated for the drawing?	SCALE 1:2	1
1.2 How many parts make up the belt tensioner?	13	1
1.3 What material is used for the bearing?	STEEL	1
1.4 What should all unspecified radii be?	R3	1
1.5 What is the diameter of the balls for the bearing?	10	1
1.6 What is feature 1 in Part A called?	KEY SLOT / KEY WAY	1
1.7 What is feature 2 in Part A called?	FILLET	1
1.8 Name the type of sectioning at 3 in Part A.	REVOLVED SECTIONING	1
1.9 What is feature 4 in Part B called?	CHAMFER	1
1.10 What type of hole is shown by feature 5 in Part K?	BLIND HOLE	1
1.11 Explain the meaning of feature 6 in Part K.	SYMMETRICAL	1
1.12 What does the abbreviation "PCD" in Part D stand for?	PITCH CIRCLE DIAMETER	1
1.13 How many surfaces in Part A need to be machined?	6	1
1.14 Name the type of sectioning at 7 in Part J.	PARTIAL / PART SECTIONING	1
1.15 Calculate the exact dimension at 8 in Part I.	12.8	1
1.16 What is the length of the shaft?	152	1
1.17 Which part prevents the shaft from turning in the frame?	KEY / PART G	1
1.18 In the space below, draw in NEAT freehand, a welding symbol indicating a fillet weld all round.		3

WELDING SYMBOL



PARTS LIST		
NO	PART	MATERIAL
A	FRAME	CAST IRON
B	GEAR	CAST IRON
C	SHAFT	HIGH TENSILE STEEL
D	BALL BEARING	STEEL
E	SPACER 1	PHOSPHOR BRONZE
F	SPACER 2	PHOSPHOR BRONZE
G	KEY	MILD STEEL
H	WASHER	MILD STEEL
I	M16 HEXAGONAL NUT	MILD STEEL
J	M12 THREADED PIN	MILD STEEL
K	BASE	CAST IRON

DRAWN BY: BERNARD JAMESON
CHECKED BY: AMINA NADAR
APPROVED BY: FRANCO
DATE: 18 NOVEMBER 2017
SIGNED: CARLOS MOLELE

TITLE: BELT TENSIONER
SCALE 1:2

ALL UNSPECIFIED RADII ARE R3.
TOLERANCES ON ALL DIMENSIONS ARE: ±0.25

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ANSWER SHEET 1

EXAMINATION NUMBER

20 MARKS

QUESTION 2

LOC
CAM

The incomplete **graph of displacement of a wedge-ended follower** as well as the centre of the camshaft, as shown by the given centre lines, is given.

The cam imparts the following motion to the follower:

- 0°–90° the follower **rises** 30 mm with **uniform motion**.
- 90°–180° the follower **rises** 30 mm with **simple harmonic motion**.
- 180°–360° the follower returns to its original position with **uniform acceleration and retardation**.

The cam profile has the following specifications:

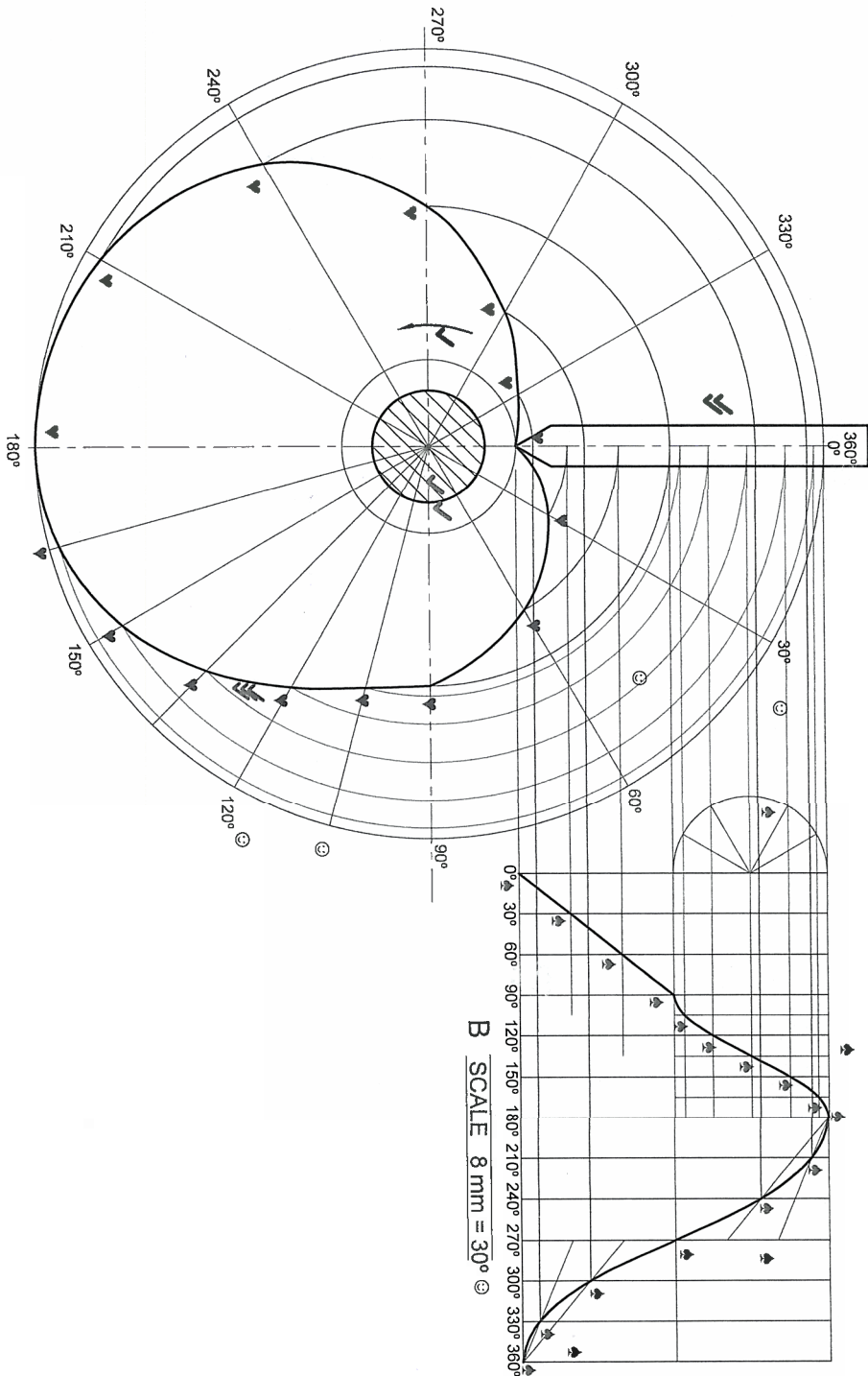
- The direction of turn is **anti-clockwise**.
- The **camshaft** has a diameter of 22 mm.

- 2.1 Draw the complete graph of displacement.
- 2.2 Draw the cam profile from the displacement graph.
- 2.3 Draw and hatch the camshaft.
- 2.4 Draw the wedge-ended follower (to your own appropriate size and measurements)
- 2.5 Draw the direction of rotation.
- 2.6 Print, in capitals, the required **label** for the graph of displacement at A, the horizontal scale at B and the vertical scale at C.
- 2.7 Show all constructions.
- 2.8 Draw and label all the divisions on the cam profile.

A DISPLACEMENT GRAPH ☺

B SCALE 8 mm = 30° ☺

C SCALE 1 mm = 1 mm ☺



ASSESSMENT CRITERIA

- | | 20/2 = 10 |
|--------------------------------|-----------|
| • Graph | 15 |
| • Plot Points | 3 |
| • Locus | 2 |
| • Shaft and Hatching | 1 |
| • Direction | 2 |
| • Follower | 7 |
| • Label, constructions & scale | |

GRPH	15	✓
20/2	15	✓
PTS	15	✓
LOC	3	✓
3	2	✓
SHFT	1	✓
DIR	2	✓
FOL	7	✓
LB	7	✓

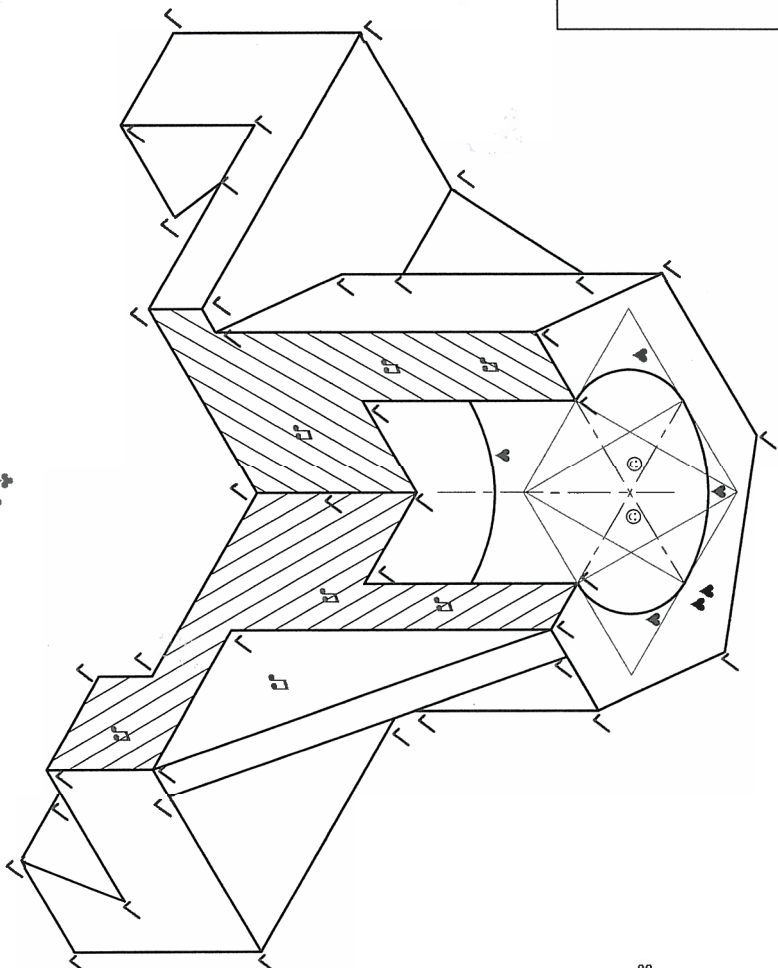
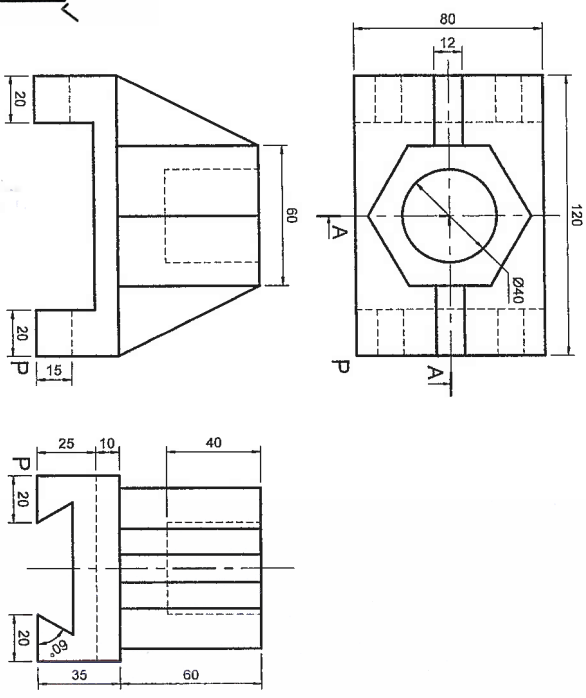
40 MARKS







EXAMINATION NUMBER

ANSWER SHEET 2

QUESTION 3
ISOMETRIC
DRAWING

- 3.1 Draw a neat *half-sectioned isometric* drawing on *cutting-plane A-A*.
- 3.2 Show the construction for the hexagon and any other auxiliary views.
- 3.3 Draw the centre lines for the circle.
- 3.4 Make point *P* the lowest part of your drawing.
- 3.5 Start your drawing on the given crosshairs.



CON	3	ISOM	40/2	CIRC	6	CLS	2	HAT	7	POS	2
											

EXAMINATION NUMBER

FIGURE 1

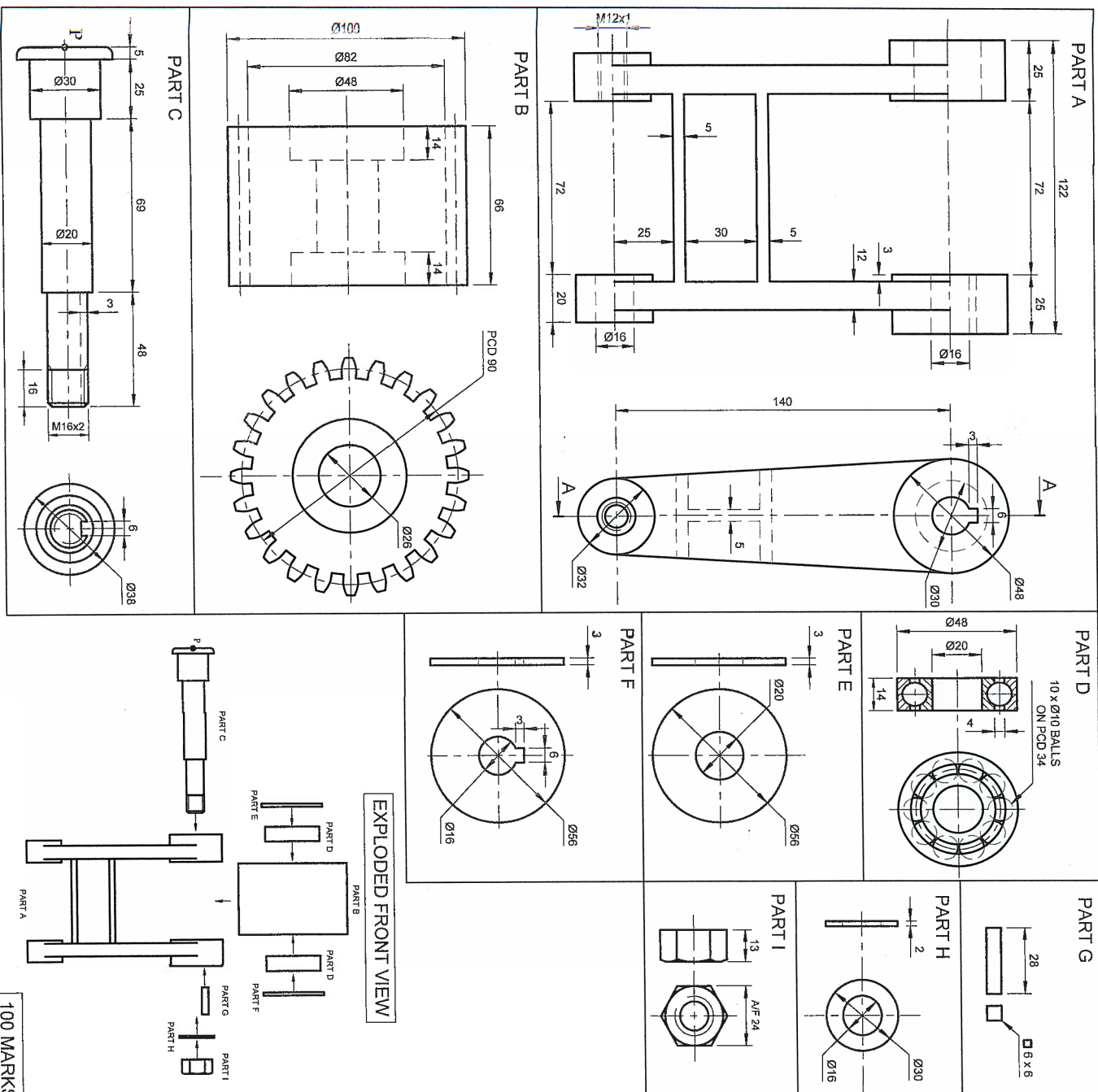


Figure 1 shows the different parts (not to scale) for a **BELT TENSIONER** that needs to be assembled.

The **exploded front view** of how the parts are assembled is also shown.

Complete the following on Answer Sheet 4 to a **scale of 1:1**.
Use the given centre lines and point P on the shaft (Part C) as a reference to plan the drawing layout.

- 4.1 Draw a **full sectional front view** of the assembled parts on cutting plane A-A.
- 4.2 Draw an **outside right view** of the assembled parts on the given centre lines.
- 4.3 Please note the following:
 - 4.3.1 Show **3 faces** of the **hexagonal nut** in the **front view**.
 - 4.3.2 Show the **hidden detail** of only the frame (Part A) in the **right view**.
 - 4.3.3 Draw the **cutting plane** and the missing centre lines.
 - 4.3.4 Insert **3 functional dimensions** in the **front view**.
 - 4.3.5 Draw the projection **symbol** in the space provided.
 - 4.3.6 Print the **title** and **scale** in the space provided.
 - 4.3.7 Correctly label the completed **front view**.
 - 4.3.8 The bearings (Part D) must be drawn in convention.

EXPLODED FRONT VIEW

PARTS LIST		
NO	PART	QUANTITY
A	FRAME	1
B	GEAR	1
C	SHAFT	1
D	BALL BEARING	2
E	SPACER 1	1
F	SPACER 2	1
G	KEY	1
H	WASHER	1
I	M16 HEXAGONAL NUT	1
MATERIAL		
	CAST IRON	
	CAST IRON	
	HIGH-TENSILE STEEL	
	STEEL	
	PHOSPHOR BRONZE	
	PHOSPHOR BRONZE	
	MILD STEEL	
	MILD STEEL	
	MILD STEEL	

EXAMINATION NUMBER

100 MARKS

ASSESSMENT CRITERIA

RIGHT VIEW		
A	FRAME	7 ▽
B	GEAR	2 ▢
E/F	SPACER	1 ▽
C	SHAFT	3 ▢
H	WASHER	1 ▢
I	M6 NUT	2 ▼
HIDDEN DETAIL 6/2		3 (H)
TOTAL	19	

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