ieb assessment matters

NATIONAL SENIOR CERTIFICATE EXAMINATION

2016

ENGINEERING GRAPHICS AND DESIGN

PAPER 2

MARKS: 200
TIME: 3 HOURS

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of **7 pages** including the cover page and **4 questions.**
2. **All** the 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 **stapled** in **numerical** order and handed in, even unattempted/blank 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. Any 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 10111-1**.**
13. In order to save time, **detailed assembly parts** must be drawn to **convention.**

FOR OFFICIAL USE ONLY

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

FINAL CONVERTED MARK	CHECKED BY
/ 100	

EXAMINATION NUMBER

QUESTION 1

MECHANICAL ANALYTICAL

Figure A

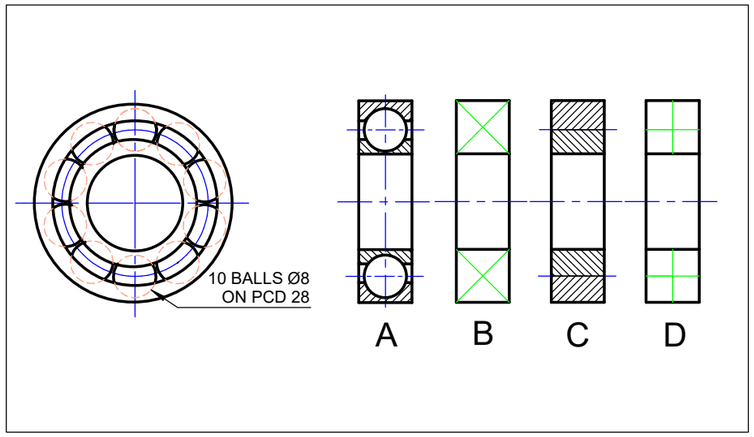


Figure B

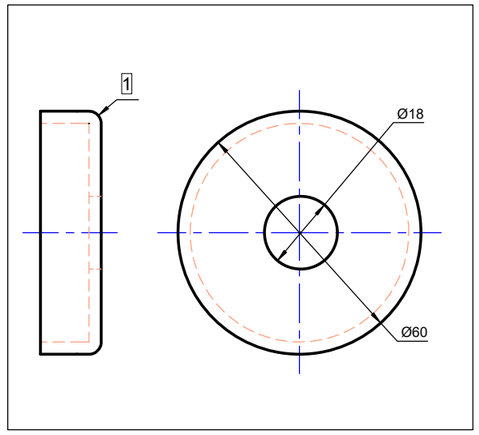


Figure C

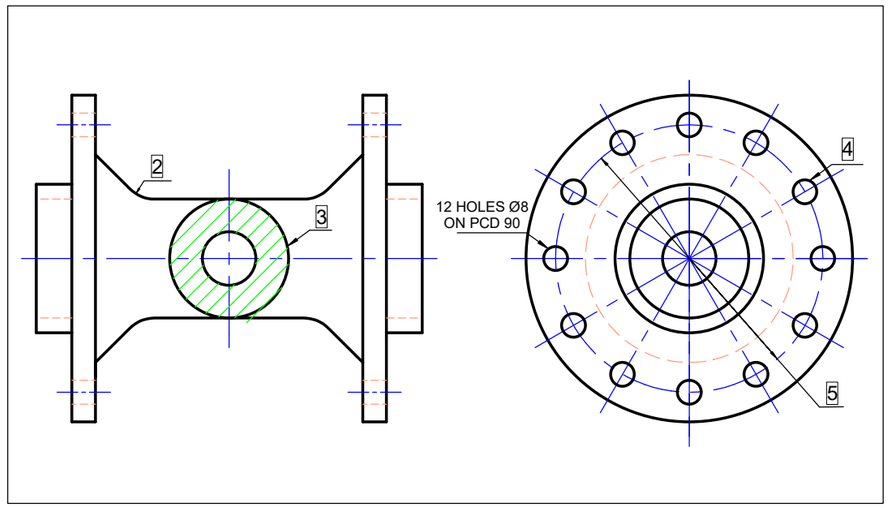


Figure D

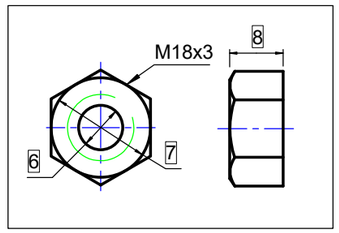


Figure E

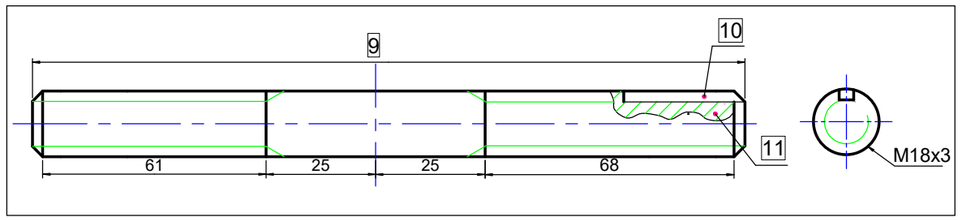


Figure F

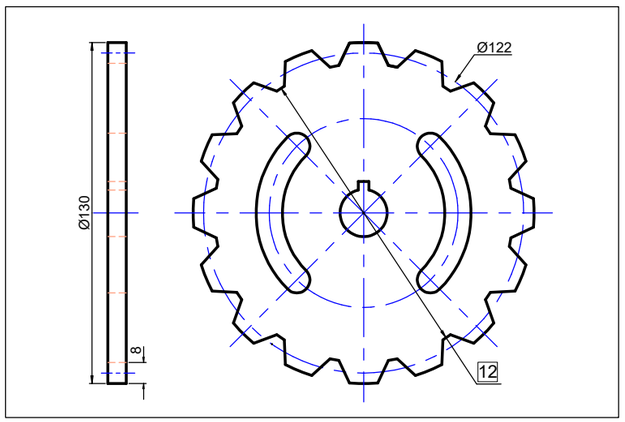


Figure G

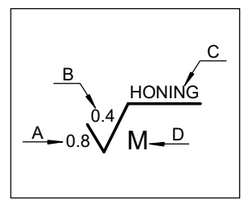
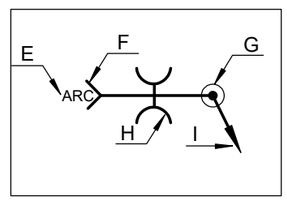


Figure H



Answer the following questions and print the correct answer in the space provided.

1.1 Which sectioned side view in Figure A is correct to convention? B _____ (1)

1.2 What is feature 1 in Figure B called? Round _____ (1)

1.3 What is feature 2 in Figure C called? Fillet _____ (1)

1.4 What type of sectioning is shown by 3 in Figure C? Revolved section _____ (1)

1.5 Calculate the dimension 4 in Figure C. Ø8/R4 _____ (1)

1.6 Calculate the dimension 5 in Figure C. Ø90/PCD 90 _____ (1)

1.7 Calculate the dimension 6 in Figure D. Ø12 _____ (1)

1.8 Calculate the dimension 7 in Figure D. Ø27 _____ (1)

1.9 Calculate the dimension 8 in Figure D. 14.4 mm/14 mm _____ (1)

1.10 Calculate the dimension 9 in Figure E. 185 mm _____ (1)

1.11 What is feature 10 in Figure E called? Keyway/keyseat _____ (1)

1.12 What type of sectioning is shown by 11 in Figure C? Partial/Part section _____ (1)

1.13 Calculate the dimension 12 in Figure F. Ø114 _____ (1)

1.14 Is the thread in Figure E internal or external? External _____ (1)

1.15 Figure G shows a ***machining symbol***. Complete the table below by printing the correct letter next to the corresponding phrase. (3)

Phrase	***Letter***
1.15.1 Production method	C
1.15.2 Direction of lay	D
1.15.3 Machine allowance	A

1.16 Figure H shows a ***welding symbol***. Complete the table below by printing the correct letter next to the corresponding phrase. (3)

Phrase	***Letter***
1.16.1 Weld all around	G
1.16.2 Welding process	E
1.16.3 Welding symbol	H

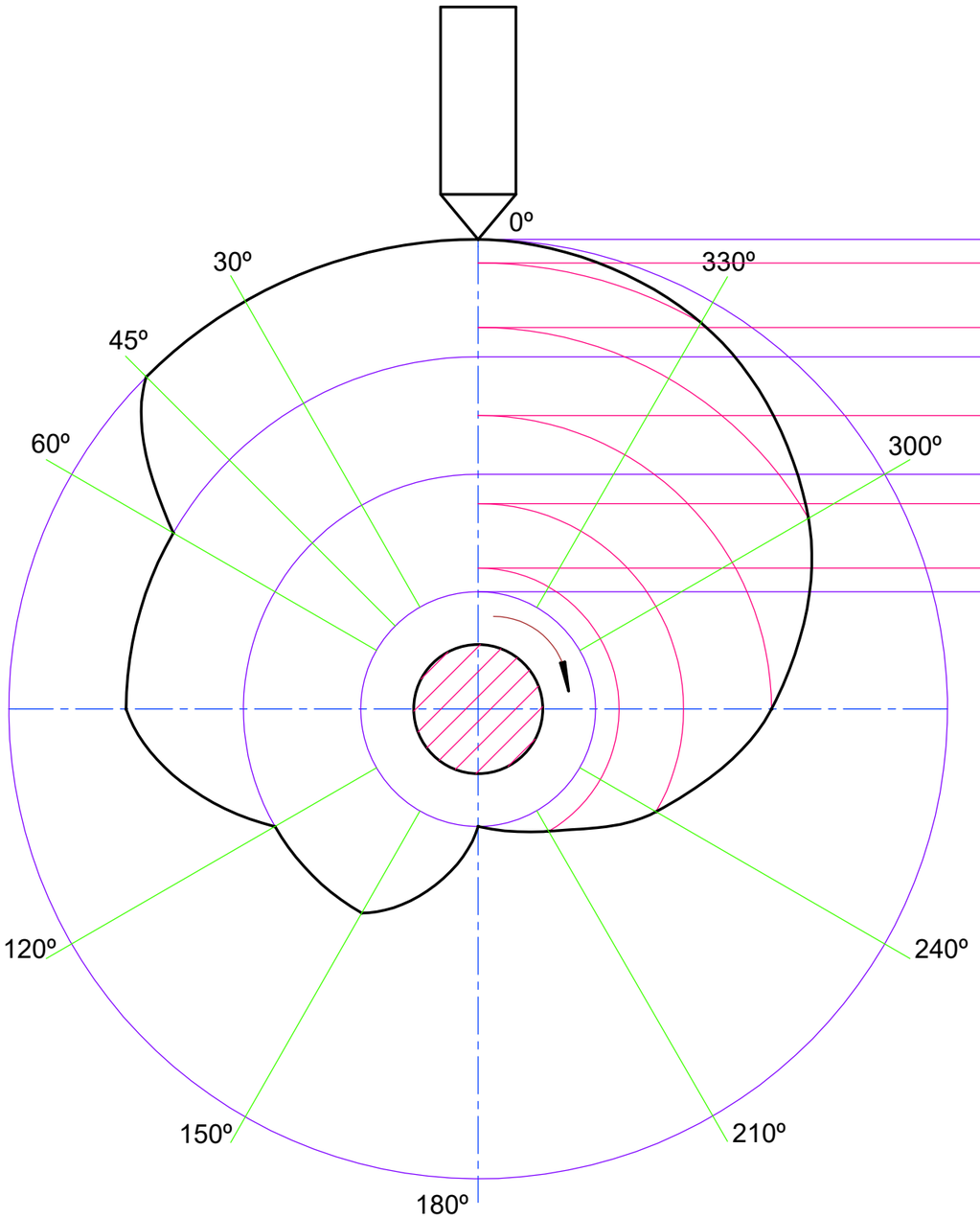
20 MARKS

EXAMINATION NUMBER

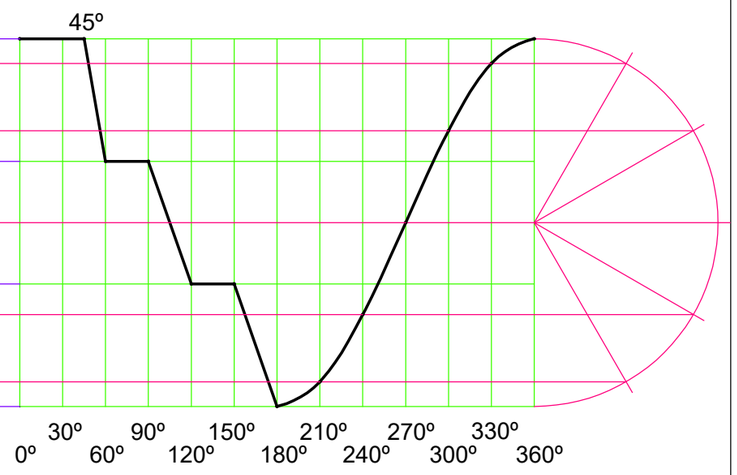
ANSWER SHEET 1

QUESTION 2a

LOCUS CAM



DISPLACEMENT GRAPH/DIAGRAM



HORIZONTAL SCALE 7MM = 30º

Given is the incomplete ***graph*** of ***displacement*** of a ***wedge-ended*** follower as well as the centre of the cam shaft as shown by the given centrelines.

The graph of displacement has the following motion:

- ✓ 0°-45° the follower is at ***rest***. (Given) (**Uniform motion**)
- ✓ 45°-60° the follower ***falls 20 mm***. (**Uniform motion**)
- ✓ 60°-90° the follower is at ***rest***. **(Uniform motion)**
- ✓ 90°-120° the follower ***falls 20 mm***. (**Uniform motion**)
- ✓ 120°-150° the follower is at ***rest***. (**Uniform motion**)
- ✓ 150°-180° the follower ***falls 20 mm***. (**Uniform motion**)
- ✓ 180°-360° the follower ***returns to its original position*** with **simple harmonic motion**.

The cam profile has the following specifications:

- ➢ The direction of turn is ***clockwise***.
- ➢ The ***camshaft*** has a radius of 11 mm.

Draw the following:

2a.1 the complete graph of displacement.
2a.2 the cam profile.
2a.3 the wedge-ended follower (to your own appropriate size and measurements).
2a.4 the camshaft.
2a.5 the direction of rotation.
2a.6 show all constructions.
2a.7 label the graph of displacement and the horizontal scale.

ASSESSMENT CRITERIA		
☑	Graph 13/2	6½
☑	Label/Scale	2
☑	Setup/Plot Points 13/2	6½
☑	Shaft and hatch	2
☑	Direction	1
☑	Locus	1
☑	Follower	1

GRPH 6½	
LBL 2	
PLOT 6½	
SHFT 2	
DIR 1	
L/F 2	
20 MARKS	

EXAMINATION NUMBER

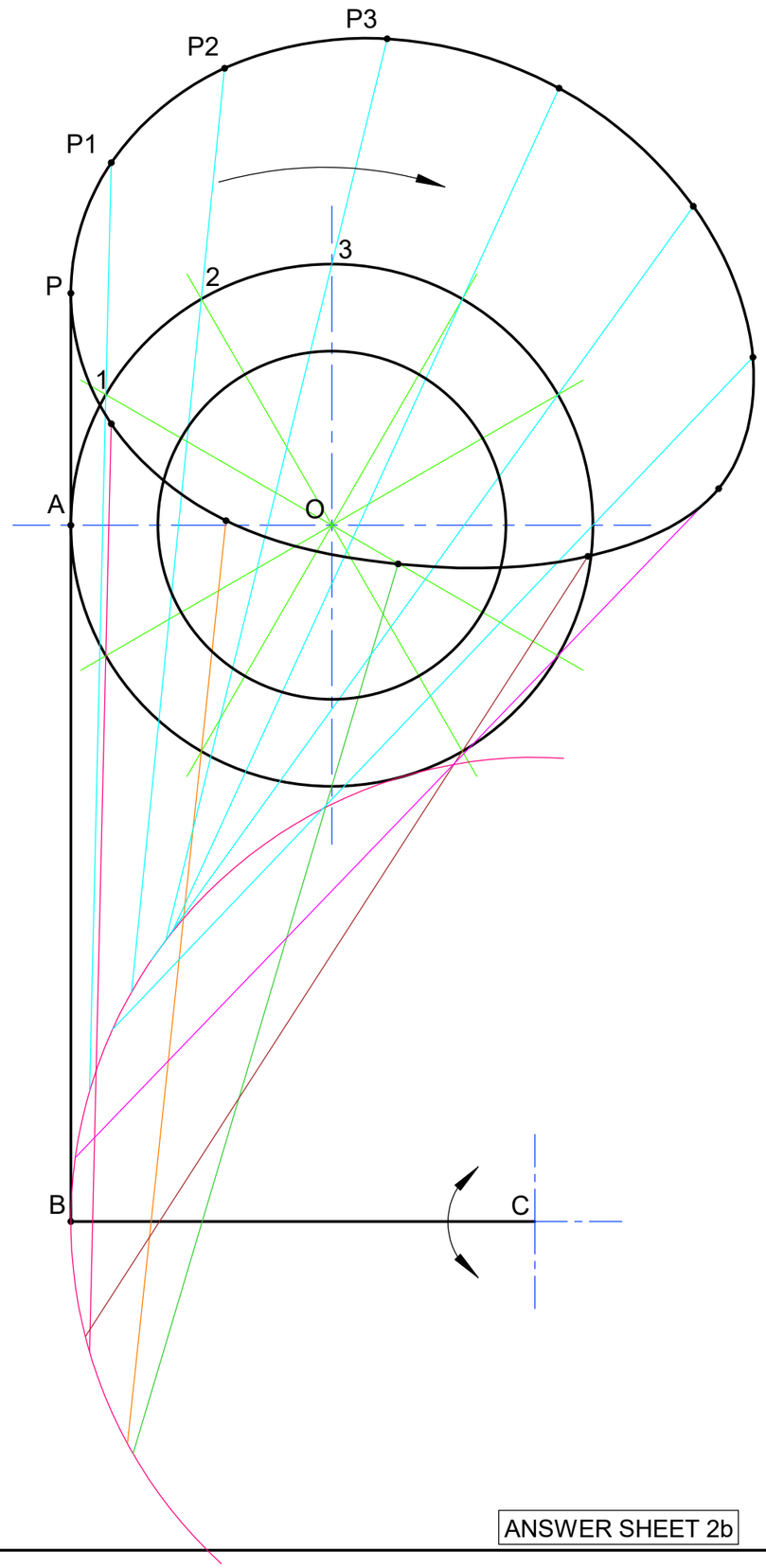
ANSWER SHEET 2a

QUESTION 2b

LOCUS MECHANISM

The given figure shows a wheel, rotating around the centre O, with a ***rod*** AB attached to it at point A. The end of the rod (B) is attached to a ***second rod*** (BC) that is free to move about its anchor point C. **Rod** BC rocks back and forth as the wheel rotates. Construct and draw the locus of ***point P*** if the direction of rotation is ***clockwise***.

Show all ***constructions*** and indicate the ***direction*** correctly.



ANSWER SHEET 2b

ASSESSMENT CRITERIA		
☑	Setup	5
☑	Plot Points	11
☑	Direction	1
☑	Locus	3

SET 5	
PTS 11	
DIR 1	
LOC 3	
20 MARKS	

EXAMINATION NUMBER

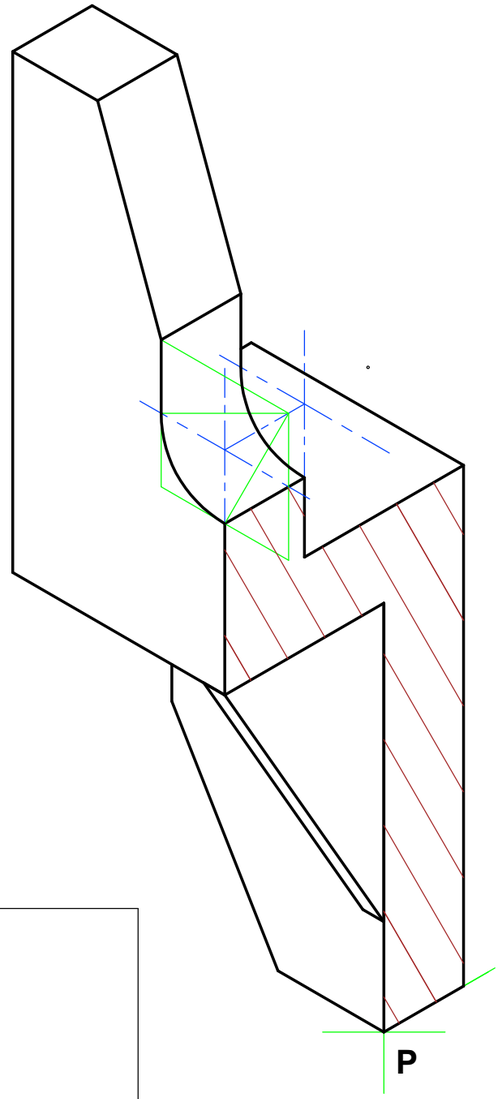
QUESTION 3

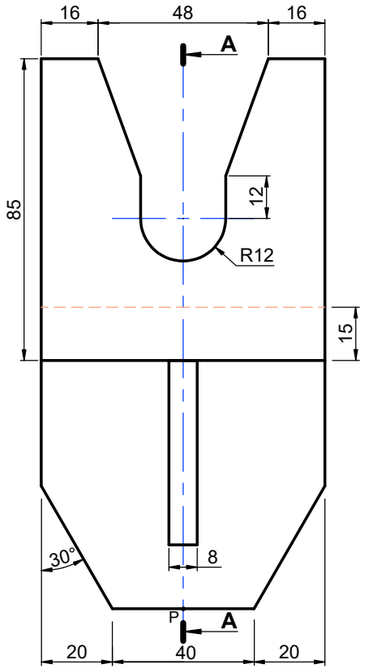
ISOMETRIC DRAWING

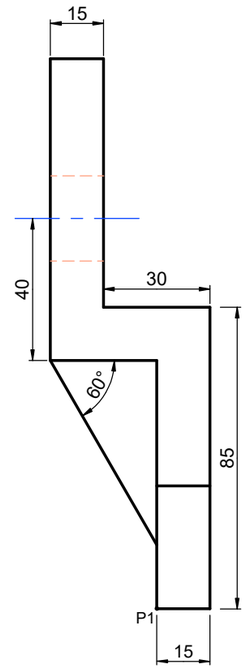
The figure below shows the front view and right view of a heavy duty **BRACKET**. The **BRACKET** has been cut by a ***cutting plane A-A.***

Draw the following:

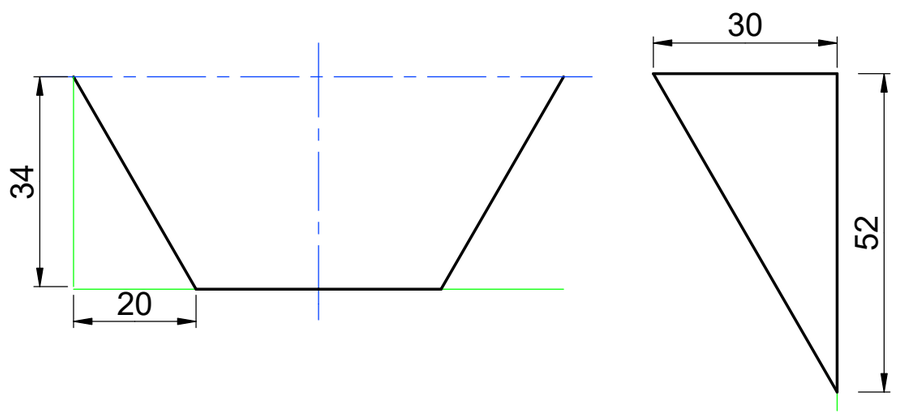
3.1 draw a neat **Sectioned Isometric** on the cutting plane A-A.
3.2 show the constructions for the hexagon and the angle in the given area.
3.3 draw all centrelines.
3.4 make point P the lowest part of your drawing.
3.5 start your drawing on the given crosshairs.







CONSTRUCTION AREA



ANSWER SHEET 3

ASSESSMENT CRITERIA

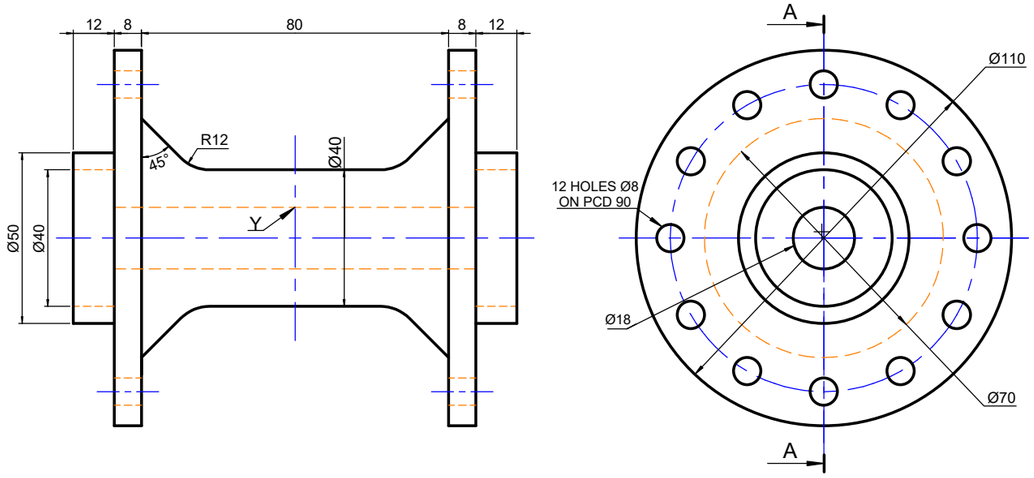
☑	Constructions	4
☑	Iso points	22
☑	Iso circles	6
☑	Centrelines	3
☑	Hatching	3
☑	Non-hatching	2
☑	Positioning	-2

CON 4	
ISOM 22	
CIRC 6	
CLS 3	
HAT 3	
NO-H 2	
POS -2	
40 MARKS	

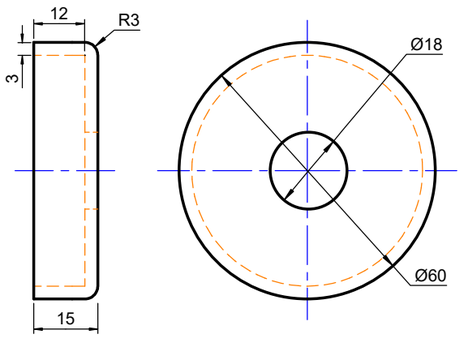
EXAMINATION NUMBER

FIGURE 1

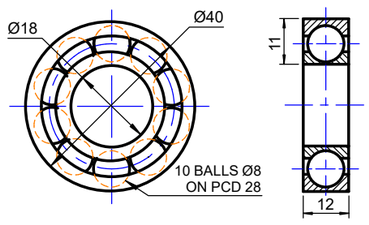
PART A



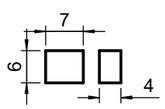
PART D



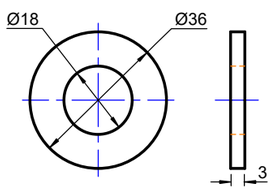
PART C



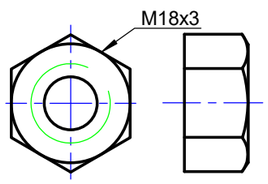
PART F



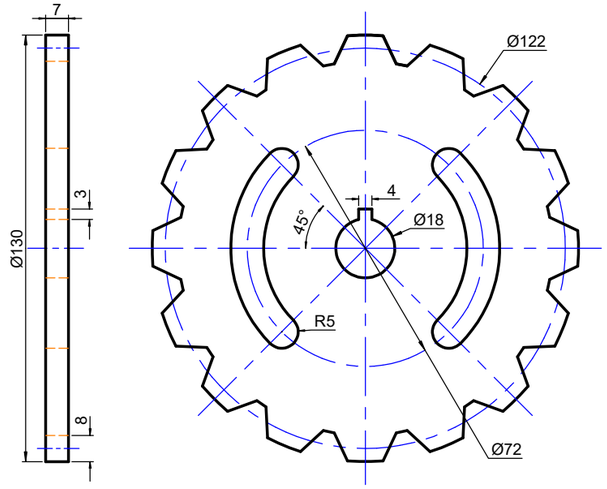
PART G



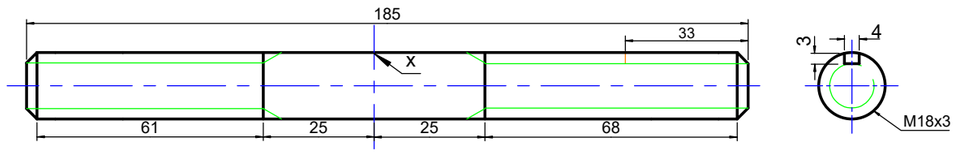
PART H



PART E



PART B



COMPONENT LIST			
NO.	PART	QUANTITY	MATERIAL
A	HUB	1	STAINLESS STEEL
B	SHAFT	1	MILD STEEL
C	BEARING	2	MILD STEEL
D	DUST COVER	2	MILD STEEL
E	GEAR	1	MILD STEEL
F	KEY	1	STEEL
G	WASHER	2	MILD STEEL
H	M18 NUT	2	MILD STEEL

QUESTION 4

MECHANICAL ASSEMBLY

Figure 2 shows a series of pictures of a bicycle ***REAR HUB***, as well as an exploded view of how the components of a similar, simplified system are assembled. A list of components is also shown.

Figure 1 shows the different components (not drawn to scale) that need to be assembled.

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

4.1 A sectioned ***Front View*** of the assembled components on the cutting plane ***A-A.***

4.2 A ***Right View*** of the assembled components.

4.3 Please note the following:

- 4.3.1 ***Point Y*** on the hub (Part A) must be assembled on ***Point X*** of the shaft (Part B).
- 4.3.2 ***Point Y*** indicates the midpoint.
- 4.3.3 Show ***3 faces*** for the hexagonal ***nuts*** on the front view.

4.4 Show ***hidden detail*** on the ***right view*** of only the ***Dust Cover*** (Part D) and ***Key*** (Part F).

4.5 Draw the ***cutting plane*** and the ***centrelines***.

4.6 Draw 3 functional ***dimensions***.

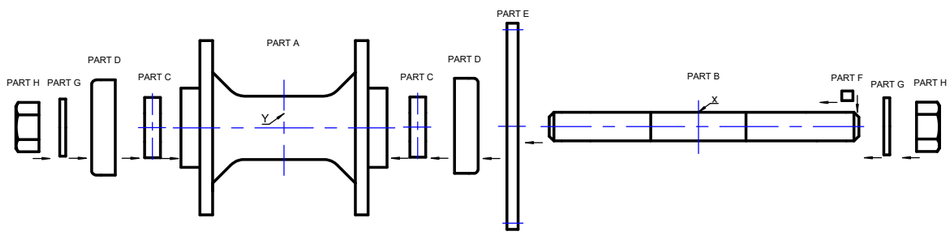
4.7 Draw the projection ***symbol*** in the space provided.

4.8 Print the ***title*** and ***scale*** in the space provided.

4.9 Label the ***sectioned view***.

FIGURE 2

FRONT VIEW

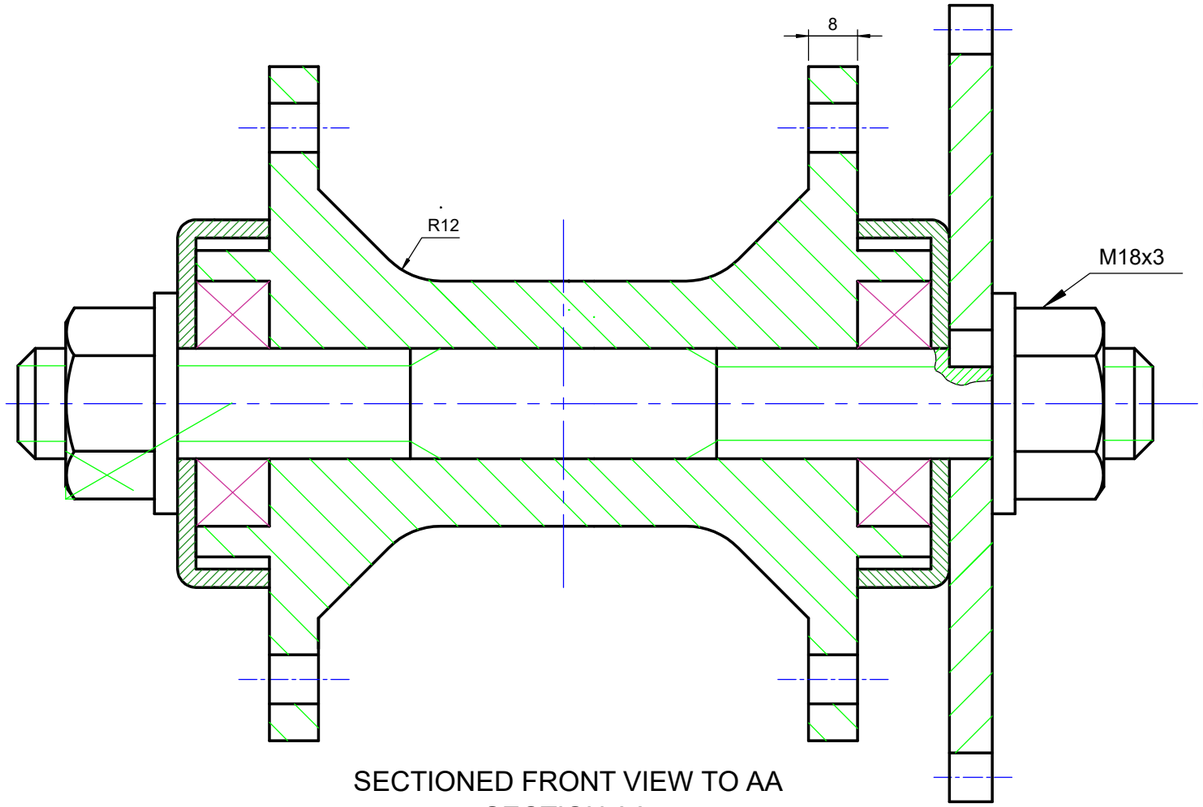


100 MARKS

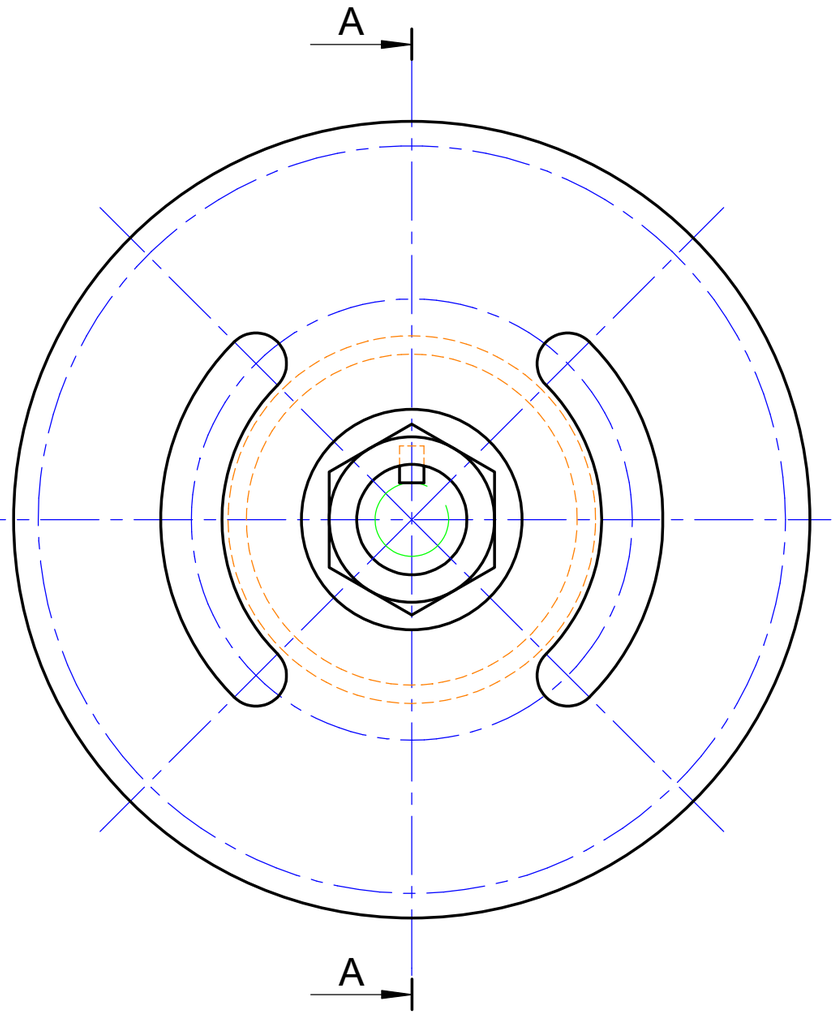
EXAMINATION NUMBER

QUESTION 4

MECHANICAL ASSEMBLY



SECTIONED FRONT VIEW TO AA
SECTION AA



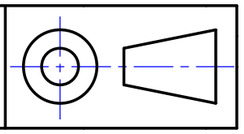
ASSESSMENT CRITERIA

FRONT VIEW			
A	HUB	20	
B	SHAFT	5	
C	BEARINGS	6	
D	DUST COVERS	6	
E	GEAR	4	
F	KEY	1	
G	WASHERS	4	
H	M18 NUTS	6	
TOTAL	52		

RIGHT VIEW			
E	GEAR	9	
F	KEY	1	
G	WASHER	1	
H	M18 NUT	2	
B	SHAFT	2	
	HIDDEN DETAIL	3	
TOTAL	18		

ADDITIONAL		
CORRECT ASS.	3	
HATCHING	9	
NON-HATCHING	4	
CENTRELINES 8/2	4	
DIMENSIONS	3	
CUTTING PLANE	2	
SYMBOL	2	
TITLE/SCALE	2	
LABEL	1	
TOTAL	30	
TOTAL	100	

TITLE	REAR HUB
SCALE	I:I

SYMBOL 

ANSWER SHEET 4

100 MARKS

EXAMINATION NUMBER