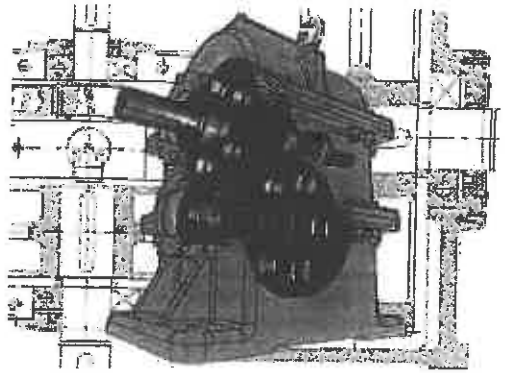
NATIONAL SENIOR CERTIFICATE EXAMINATION

2015

ENGINEERING GRAPHICS AND DESIGN

PAPER 2

MARKS: 200
TIME: 3 HOURS



FOR OFFICIAL USE ONLY				
QUESTION	SECTION	MARK	MODERATED	MAXIMUM	CODE
1	MECHANICAL ANALYTICAL			20	
2a	HELIX			20	
2b	MECHANISM			20	
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** 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, 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 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.

EXAMINATION NUMBER

QUESTION 1

MECHANICAL ANALYTICAL

Figure A

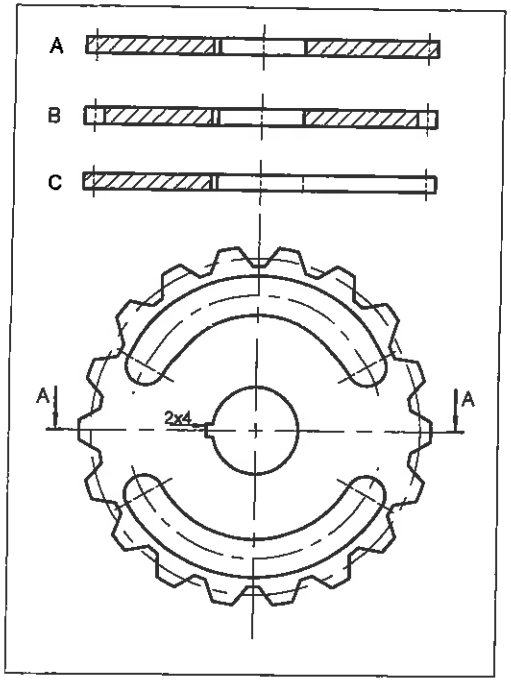


Figure B

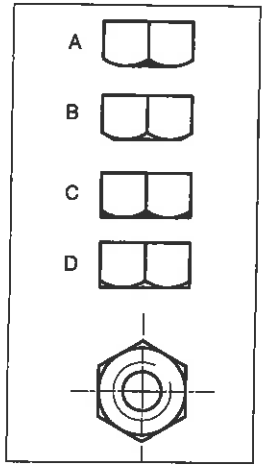


Figure C

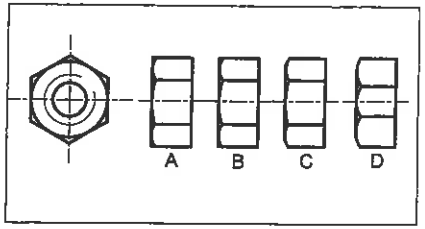


Figure D

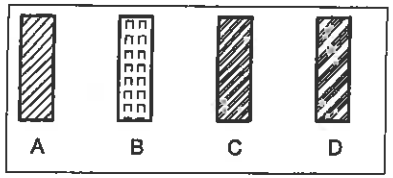
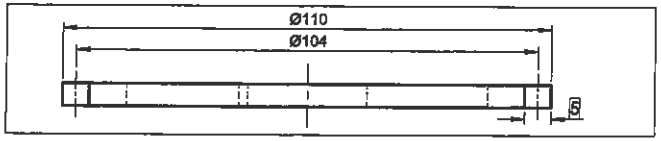


Figure G



Complete the following questions by writing the correct answer in the space provided.

1.1 Which top view in Figure A is correct to convention? _____ (1)

1.2 Which top view of the nut in Figure B is correct? _____ (1)

1.3 Which side view of the nut in Figure C is correct? _____ (1)

1.4 Which hatching, for steel, in Figure D is correct? _____ (1)

1.5 The feature 1 on Figure E is a/an _____ (1)

1.6 The feature 2 on Figure E is a/an _____ (1)

1.7 The feature 3 on Figure E is a/an _____ (1)

1.8 Calculate the diameter 4 of the circle in Figure F. _____ (1)

1.9 Calculate the dimension 5 in Figure G. _____ (1)

1.10 The feature 6 on Figure H is a/an _____ (1)

1.11 Calculate the dimension 7 on Figure H. _____ (1)

1.12 Calculate the dimension 8 on Figure I. _____ (1)

1.13 **Is the thread in Figure F internal or external?** _____ (1)

1.14 **Is the thread in Figure H internal or external?** _____ (1)

1.15 Figure J shows an incomplete ***welding symbol***. Complete the symbol for a ***single-V butt weld*** that will be welded ***all around*** and ***on the site***. (3)

1.16 Figure K shows an incomplete ***machine symbol***. Insert the following data correctly on the symbol:

1.16.1 Direction of lay is Circular.

1.16.2 Roughness value of 0.7.

1.16.3 Finishing by Chrome plating. (3)

Figure E

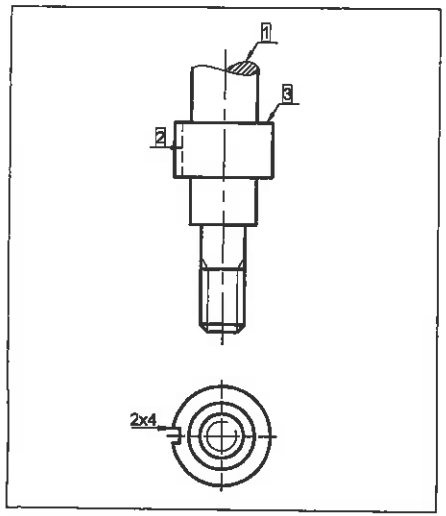


Figure F

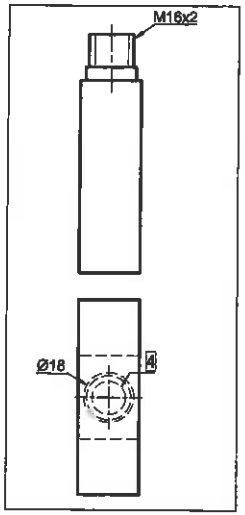


Figure H

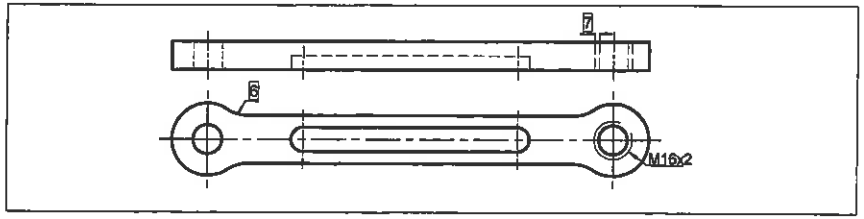


Figure I

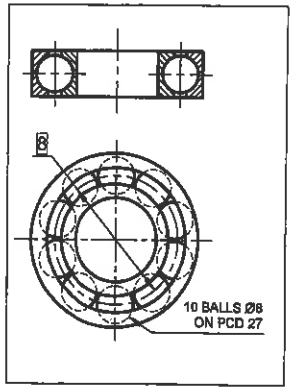


Figure J

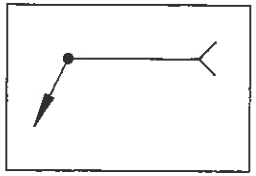
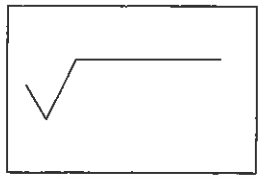


Figure K



20 MARKS

EXAMINATION NUMBER

ANSWER SHEET 1

QUESTION 2a

LOCI
HELIX

FIGURE 1

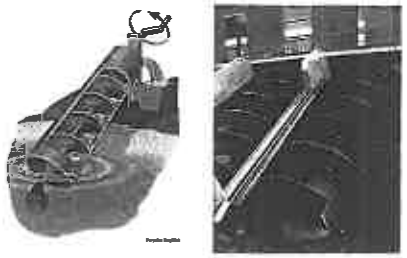


Figure 1 shows some examples of the principle of an auger being used to transport water in an elevated motion. Given is the incomplete ***auxiliary view*** and ***front view*** of an ***auger*** that will be used to elevate water from the lower reservoir to the upper canal in a water theme park. Project and draw the auger to the following specifications:

- The helix is ***left-handed.***
- The auger ***starts*** at ***point*** A.
- Complete ***2 turns*** if the pitch is ***60 mm.***
- Show all ***constructions.***

A

CANAL

RESERVOIR

ASSESSMENT CRITERIA

☑	Setup	3
☑	Plot Points	14
☑	Auxiliary View	1
☑	Loci	2

SET 3

PLOT 14

AUX 1

LOC 2

20 MARKS

EXAMINATION NUMBER

ANSWER SHEET 2a

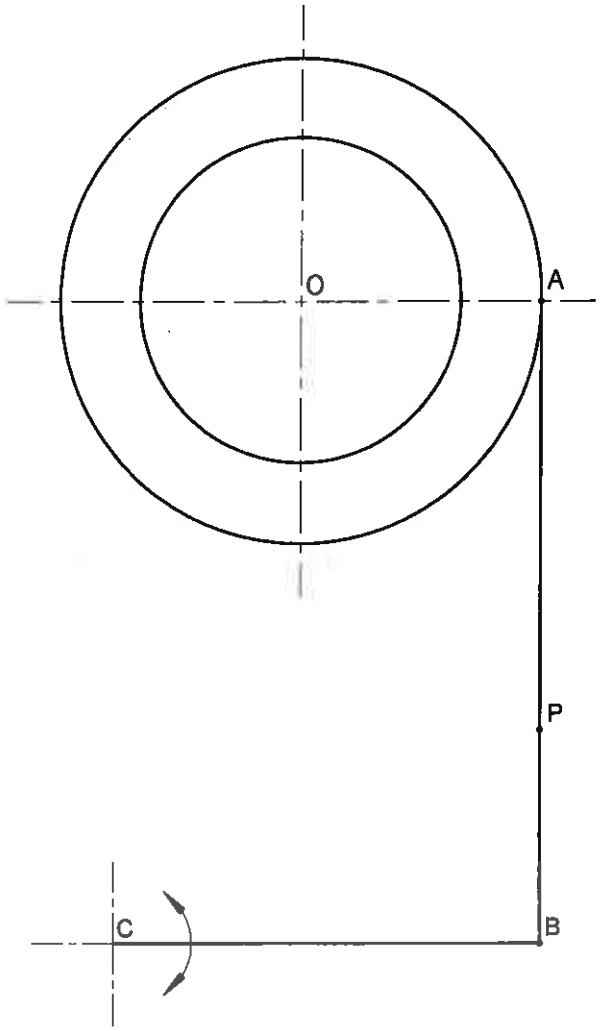
QUESTION 2b

LOCI 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*** that is free to move about its anchor point C. 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.



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

SET 5	
PTS 11	
DIR 1	
LOC 3	
20 MARKS	

EXAMINATION NUMBER

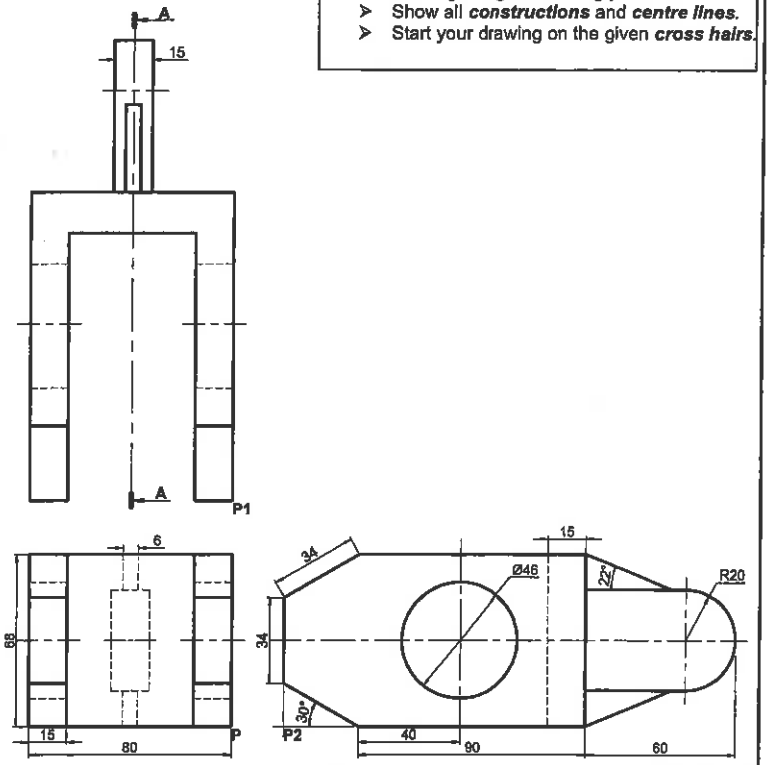
ANSWER SHEET 2b

QUESTION 3

ISOMETRIC DRAWING

The figure below shows three views of a heavy-duty ***LINK***.

- Complete a neat, sectioned ***isometric*** drawing using the ***cutting plane A-A***.
- Show all ***constructions*** and ***centre lines***.
- Start your drawing on the given ***cross hairs***.



P

ASSESSMENT CRITERIA		
☑	Constructions	2
☑	Iso Points	22
☑	Iso Circles	10
☑	Centre Lines 4/2	2
☑	Hatching	2
☑	Non-hatching 4/2	2
☑	Positioning	-2

CON 2	
ISOM 22	
CIRC 10	
CLS 2	
HAT 2	
No-H 2	
Pos -2	
40 MARKS	

ANSWER SHEET 3

EXAMINATION NUMBER

QUESTION 4

MECHANICAL ASSEMBLY

Figure 2 shows a series of pictures of a bicycle ***CRANK ASSEMBLY***, 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 to scale) that need to be assembled.

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

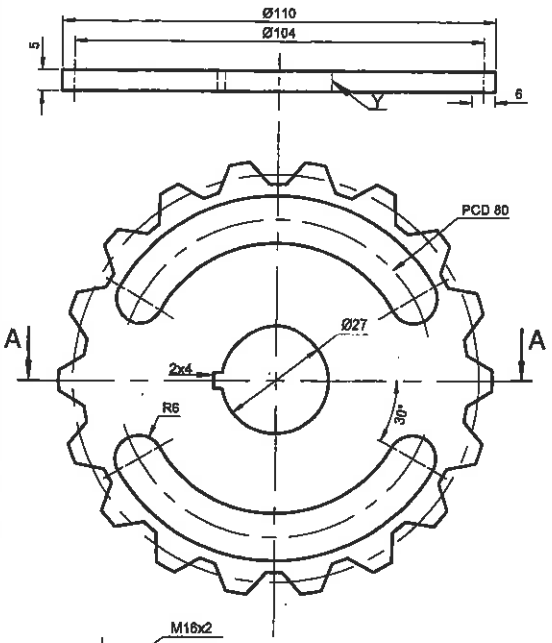
4.1 A ***Front View*** of the assembled components.
4.2 A Sectioned ***Top View*** of the assembled components to the cutting plane ***A-A.***

- 4.2.1 ***Point Y*** on the gear (Part B) must be assembled on ***Point X*** on the shaft (Part A).
- 4.2.2 ***X*** and ***Y*** indicate the midpoints.
- 4.2.3 Show ***2 faces*** for the hexagonal ***nut.***

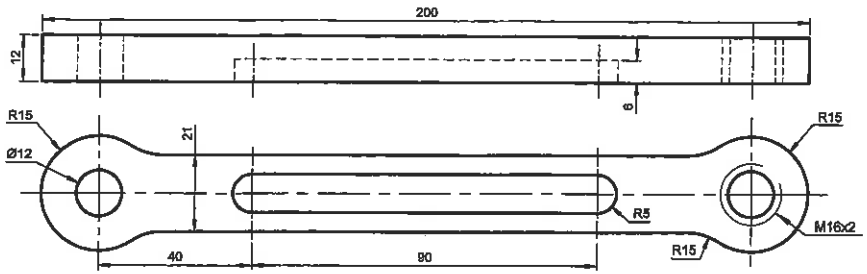
4.3 Show ***Hidden Detail*** on the ***Front View*** of only the ***Crank Arm*** (Part C).
4.4 Draw the ***Cutting Plane*** and the ***Centre Lines.***
4.5 Insert 3 important, functional ***Dimensions.***
4.6 Draw the **Projection Symbol.** (In the space provided)
4.7 Add a suitable **Title** and indicate the **Scale** used. (In the space provided)
4.8 Label the ***Sectioned View.***

FIGURE 1

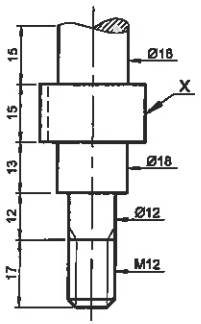
PART B



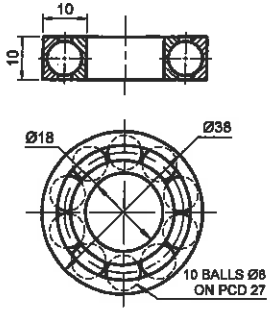
PART C



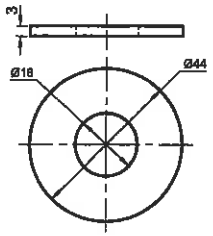
PART A



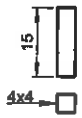
PART E

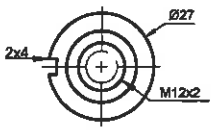


PART G

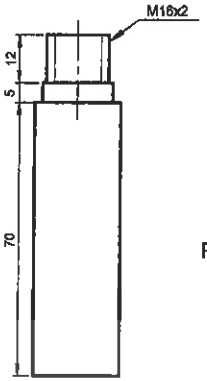


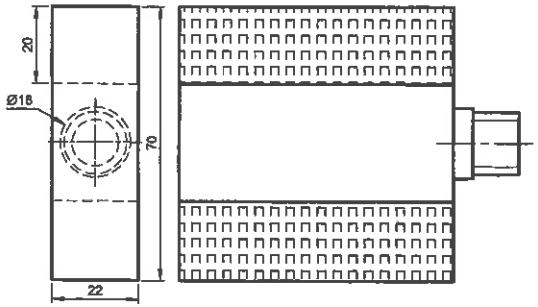
PART F



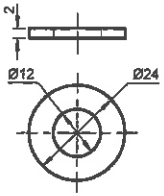


PART D

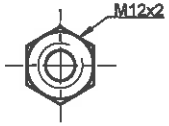




PART H

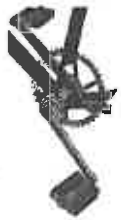


PART I

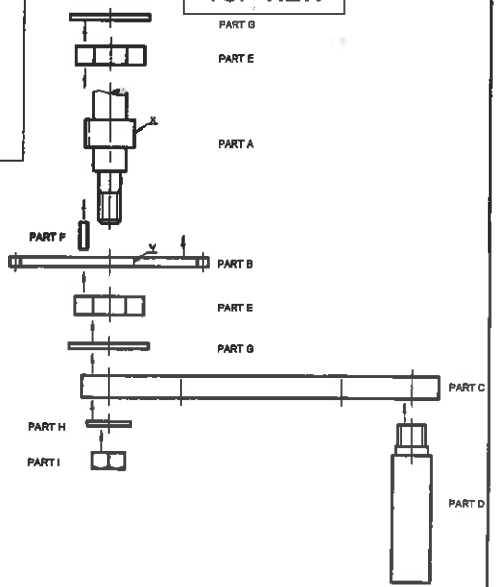


COMPONENT LIST			
NO.	PART	QUANTITY	MATERIAL
A	SHAFT	1	MILD STEEL
B	CRANK GEAR	1	MILD STEEL
C	CRANK ARM	1	MILD STEEL
D	PEDAL	1	STEEL/PVC
E	BEARING	2	MILD STEEL
F	KEY	1	MILD STEEL
G	SPACERS	2	MILD STEEL
H	WASHER	1	MILD STEEL
I	M12 NUT	1	MILD STEEL

FIGURE 2



TOP VIEW



100 MARKS

EXAMINATION NUMBER

TITLE	
SCALE	

SYMBOL	

QUESTION 4

MECHANICAL ASSEMBLY

ASSESSMENT CRITERIA

TOP VIEW			
A	SHAFT	9	
B	CRANK GEAR	5	
C	CRANK ARM	6	
D	PEDAL	6	
E	BEARINGS	6	
F	KEY	2	
G	SPACERS	2	
H	WASHER	1	
I	M12 NUT	3	
TOTAL	40		

FRONT VIEW			
A	SHAFT	2	
B	CRANK GEAR	8	
C	CRANK ARM	9	
D	PEDAL	3	
G	SPACER	1	
H	WASHER	1	
I	M12 NUT	2	
HIDDEN DETAIL		4	
TOTAL	30		

ADDITIONAL		
CORRECT ASS.	4	
HATCHING	7	
NON-HATCHING	3	
CENTRE LINES 14/2	7	
DIMENSIONS	3	
SECTION LINE	2	
SYMBOL	1	
TITLE/SCALE	2	
LABEL	1	
TOTAL	30	
TOTAL	100	

ANSWER SHEET 4

100 MARKS

EXAMINATION NUMBER