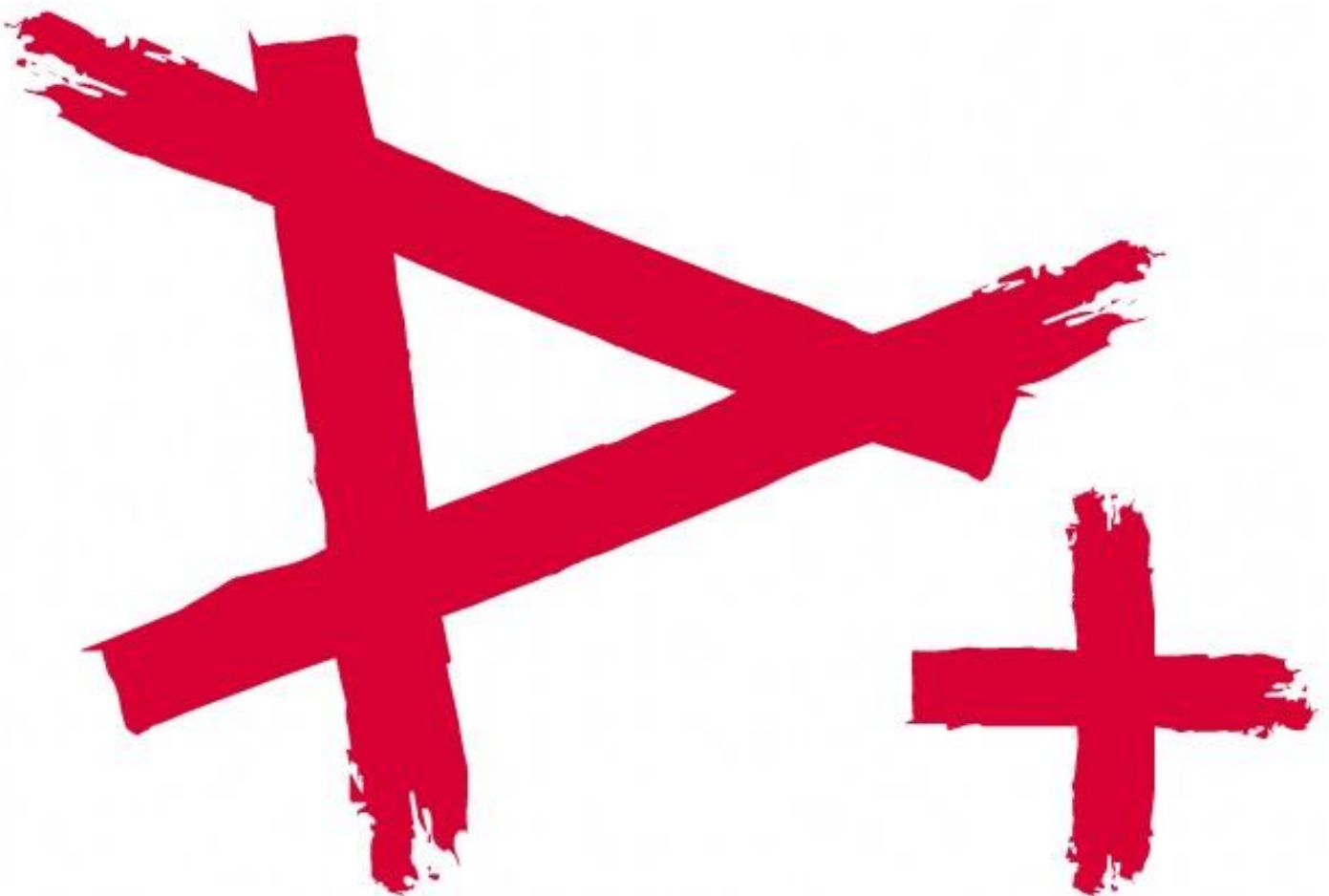




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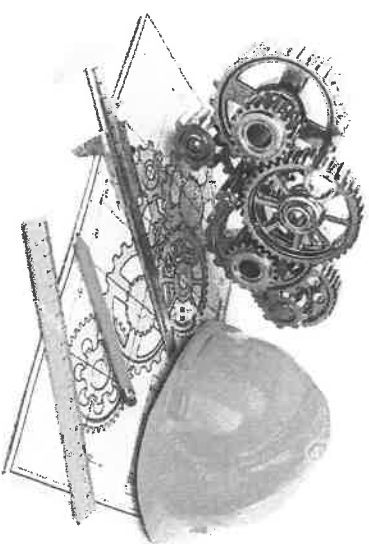
NATIONAL SENIOR CERTIFICATE EXAMINATION
2019

ENGINEERING GRAPHICS AND DESIGN
MARKING GUIDELINES
PAPER 2

MARKS: 200
TIME: 3 HOURS

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

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 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	
1	MECHANICAL ANALYTICAL			20	
2	LOCI CAM			40	
3	ISOMETRIC DRAWING			40	
4	MECHANICAL ASSEMBLY			100	
	TOTAL			200	

EXAMINATION NUMBER

QUEST
MECHA
ANALY

STUDY THE ADJACENT DRAWING AND ANSWER THE QUESTIONS THAT FOLLOW:

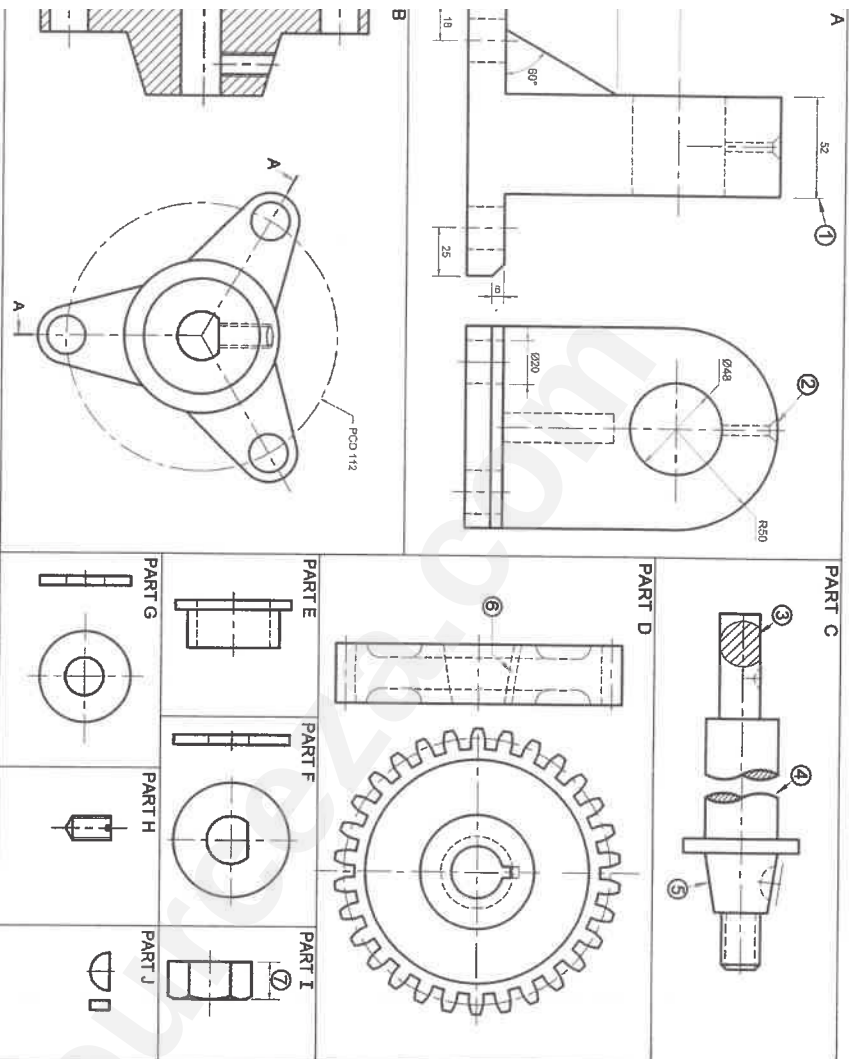
1.1 What does the abbreviation "NTS" stand for?	NOT TO SCALE
1.2 What does the abbreviation "PCD" stand for?	PITCH CIRCLE DIAMETER
1.3 Name the part that is manufactured from key steel?	WOODRUFF KEY
1.4 What is the tolerance on all dimensions?	±0.25
1.5 What are the maximum and minimum dimensions tolerated at 1 in Part A?	52.25 51.75
1.6 What type of hole is shown at 2 in Part A?	Oil / Countersunk Hole
1.7 Name the type of sectioning at 3 in Part C.	REVOLVED SECTIONING
1.8 What is feature 4 in Part C called?	S-BREAK / INTERRUPTED VIEW
1.9 What is feature 5 in Part C called?	TAPER
1.10 What is feature 6 in Part D called?	KEY WAY/KEY SLOT
1.11 Calculate the exact dimension at 7 in Part I.	M20 x 0.8 = 16
1.12 Name the type of sectioning in Part B.	ALIGNED SECTIONING
1.13 What is the total height of Part A?	159
1.14 Which part prevents the coupling from sliding on the shaft?	GRUB SCREW
1.15 In the space below, complete the welding symbol indicating a square weld on site.	

WELDING SYMBOL



1.16 In the space below, complete the machining symbol indicating a perpendicular direction of lay using a grinding method to a surface roughness value of 0.2.

MACHINING SYMBOL



SIZA ENGINEERING

DESIGN / MANUFACTURE / ENGINEERING.

INDUSTRIAL PARK
TEL: 042 5561234
FAX: 042 5561235
CELL: 093 5561236
WWW.MSMTZ.CO.ZA
info@msmtz.co.za

BY: P. SMART
DRAWN BY: FREDDIE TSHABALALA
CHECKED BY: LEONARD MEYER
DATE: 14 JULY 2019
SCALE: NTS

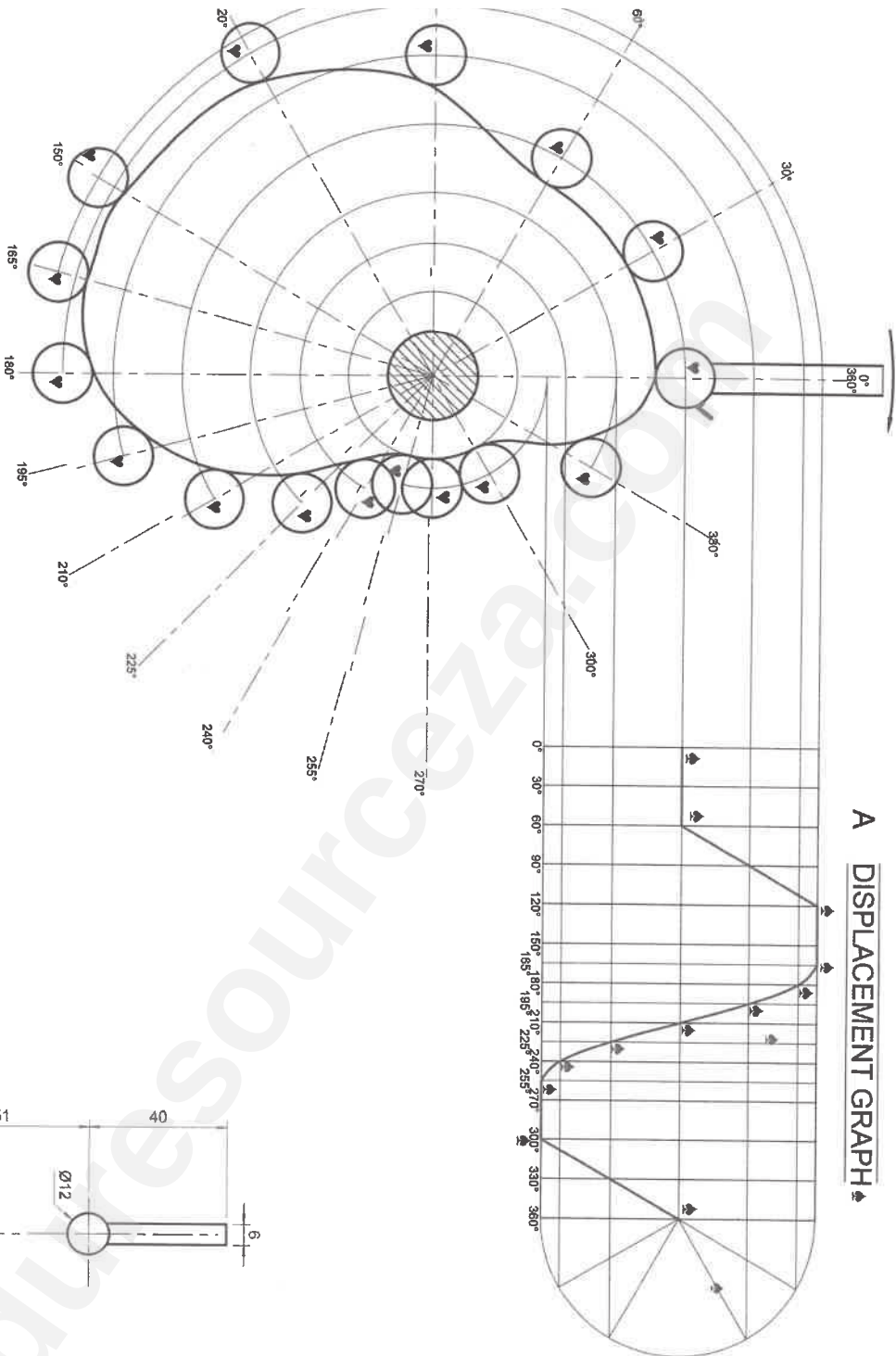
UNSPECIFIED RADII ARE R3.
DIMENSIONS ON ALL DIMENSIONS ARE: ±0.25

PARTS LIST			
NO	PART	QUANTITY	MATERIAL
A	HOUSING	1	CAST IRON
B	COUPLING	1	CAST IRON
C	SHAFT	1	MILD STEEL
D	GEAR	1	STEEL
E	BUSH	2	PHOSPHOR BRONZE
F	SPACER	1	PHOSPHOR BRONZE
G	WASHER	1	MILD STEEL
H	M12 GRUB SCREW	1	MILD STEEL
I	M20 HEXAGONAL NUT	1	MILD STEEL
J	WOODRUFF KEY	1	KEY STEEL

ANSWER SHEET 1

EXAMINATION NUMBER

A DISPLACEMENT GRAPH



The drawings show the following:

- an incomplete **graph of displacement** in position for a **roller-ended follower**.
- the centre lines of a camshaft.
- the shaft and follower detail at the starting position.

The cam imparts the following motion to the follower:

- 0° – 60° the follower is at **rest**.
- 60° – 120° the follower **rises** 28 mm with **uniform motion**.
- 120° – 185° the follower is at **rest**.
- 185° – 255° the follower **falls** 56 mm with **simple harmonic motion**.
- 255° – 300° the follower is at **rest**.
- 300° – 360° the follower **returns** to its original position with **uniform motion**.

The cam profile has the following specifications:

- The direction of turn is **clockwise**.
- The **camshaft** has a diameter of 18 mm.

- 2.1 Draw and hatch the camshaft.
- 2.2 Draw the roller-ended follower to specification.
- 2.3 Draw the complete graph of displacement.
- 2.4 Draw the direction of rotation.
- 2.5 Draw and label all the divisions on the cam profile.
- 2.6 Draw the cam profile from the displacement graph.
- 2.7 Label the graph of displacement at A.
- 2.8 Show all constructions.

ASSESSMENT CRITERIA

- Graph & Label
- Plot Points
- Locus & Construction
- Shaft and Hatching
- Direction & Divisions
- Follower

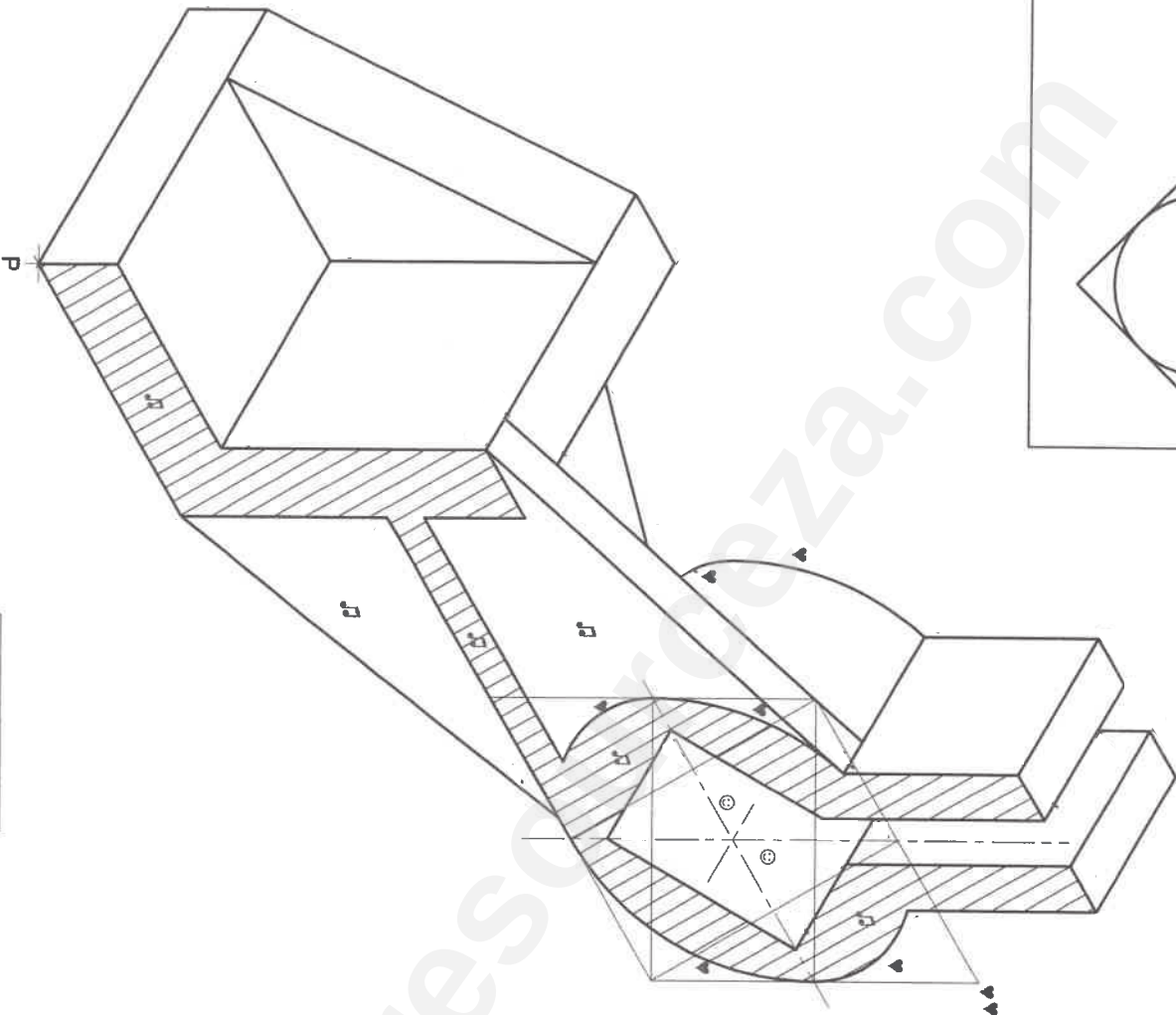
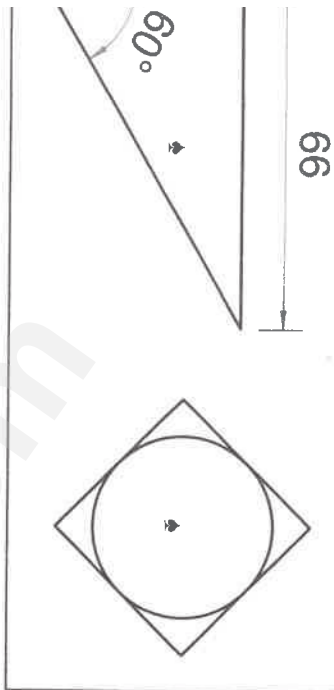
- 15
- 16
- 4
- 2
- 2
- 1

GRP	PTS	LOC	SHF	DIR	FOL
15	16	4	2	2	1

EXAMINATION NUMBER

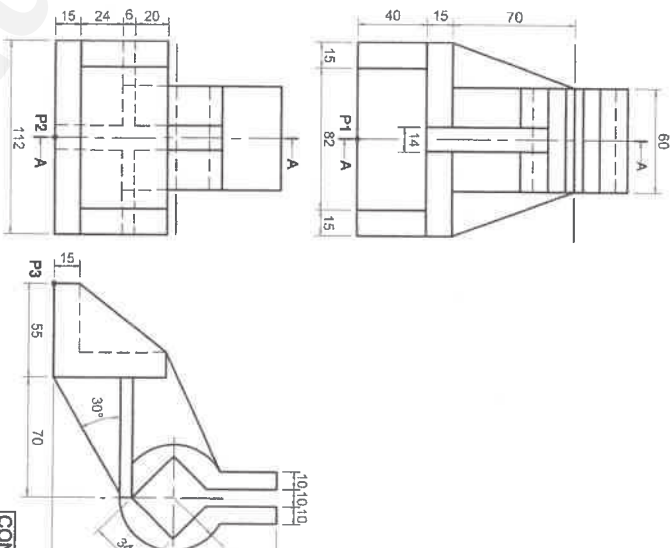
ANSWER SHEET 2

CONSTRUCTION AREA



The drawings below show the front view, top view and right view of a **CASTING**. The **CASTING** is cut by cutting-plane A-A.

- 3.1 Draw a neat full-sectioned isometric drawing on cutting-plane A-A.
- 3.2 Show the construction for the square 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.



ASSESSMENT CRITERIA

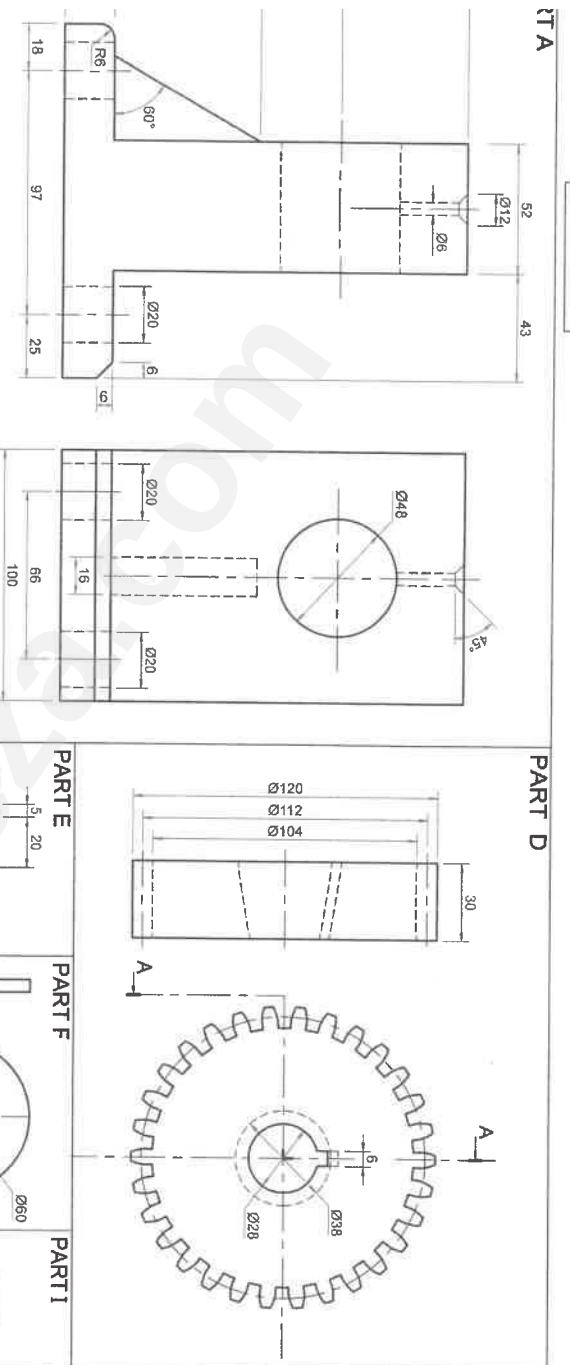
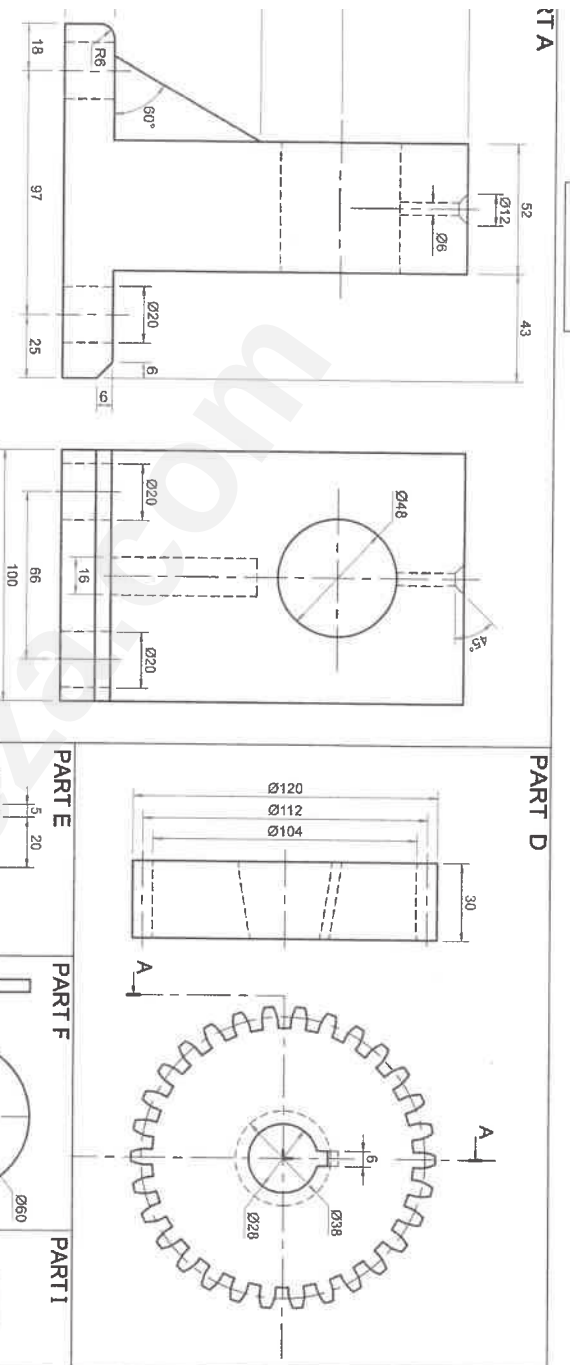
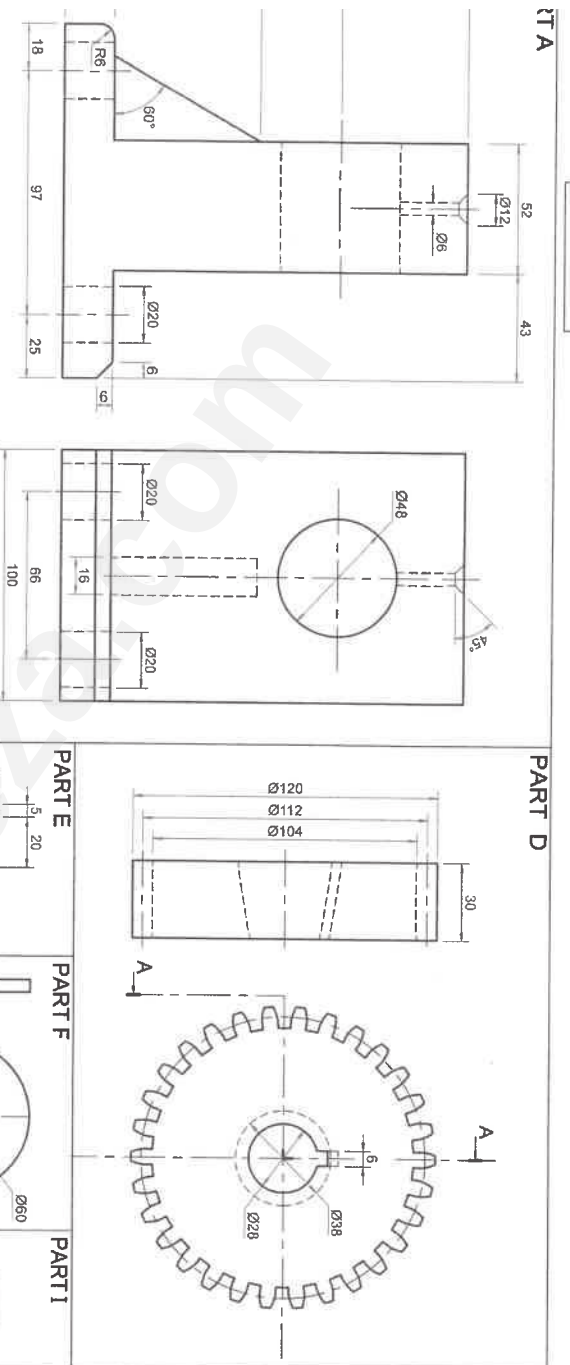
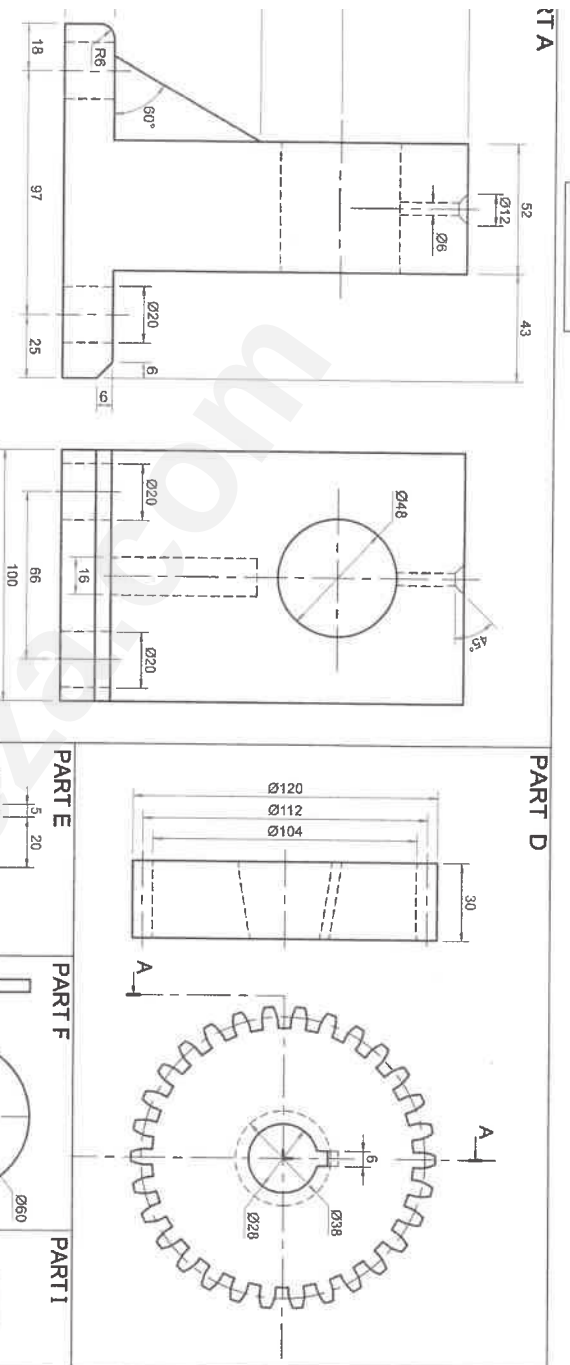
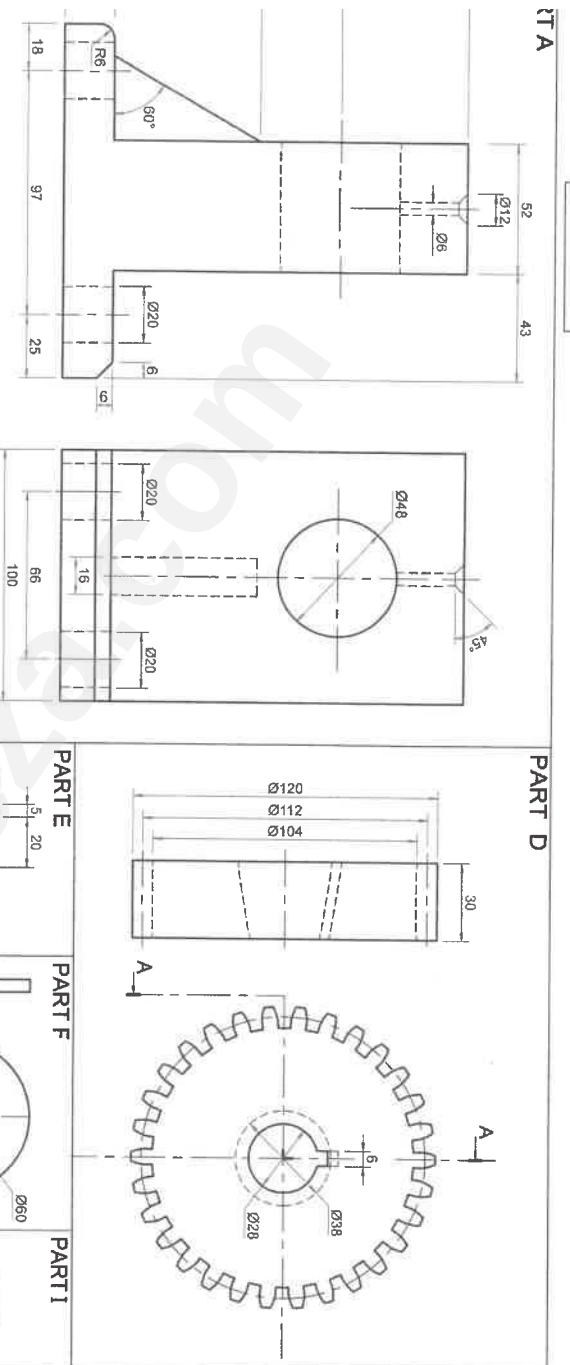
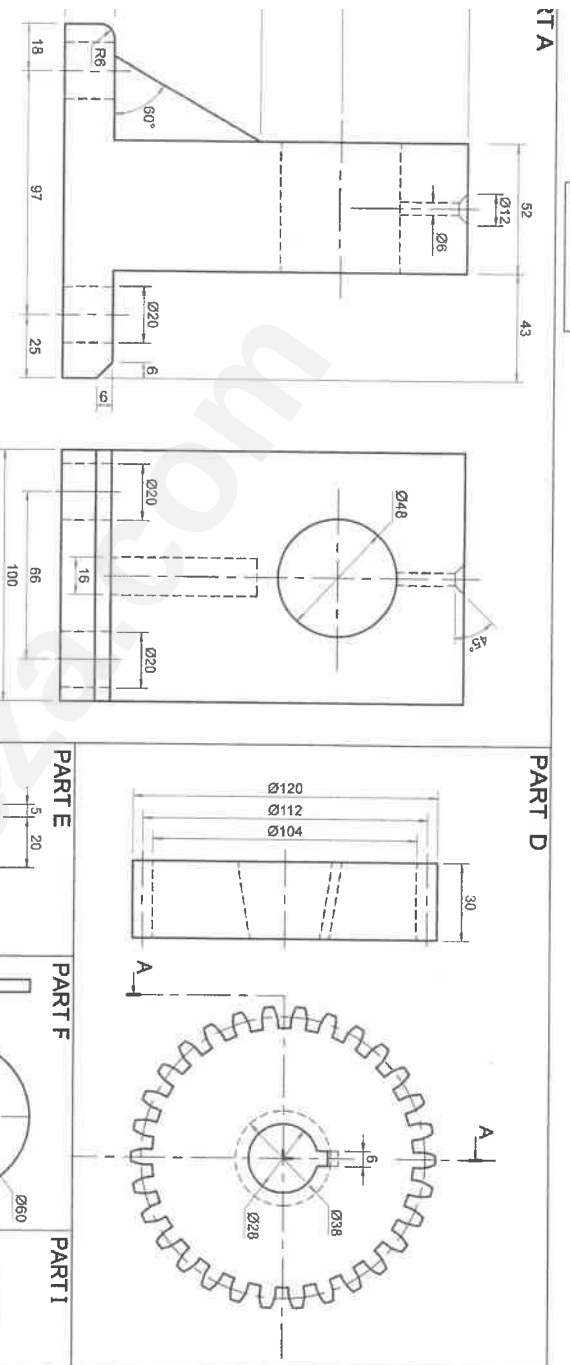
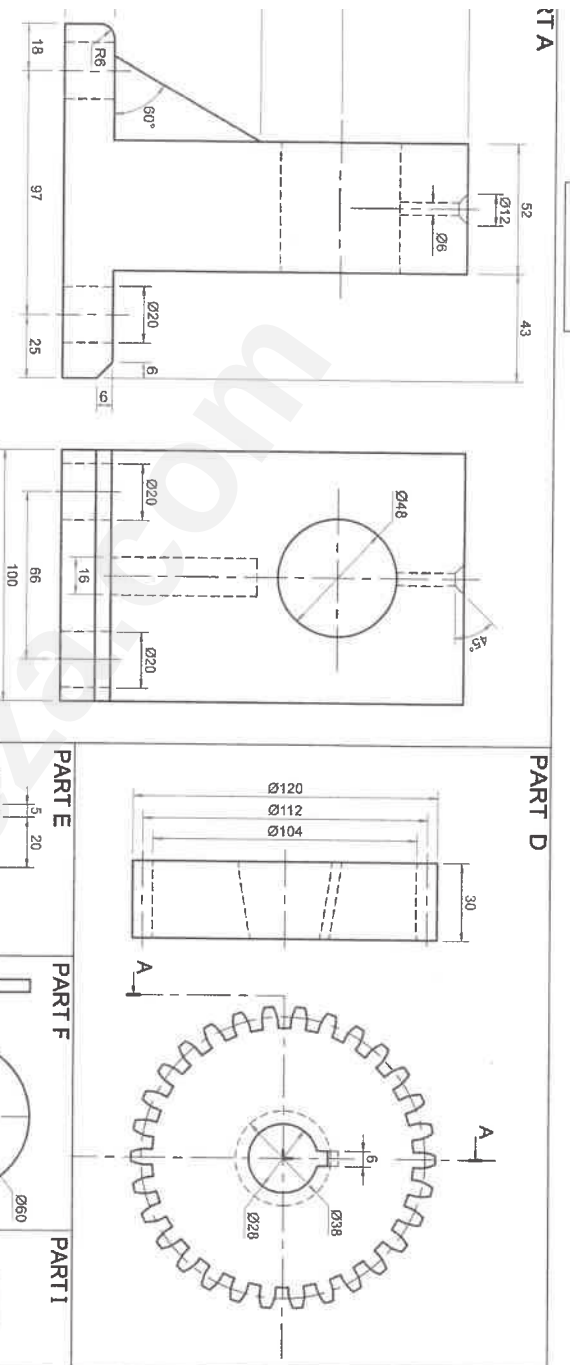
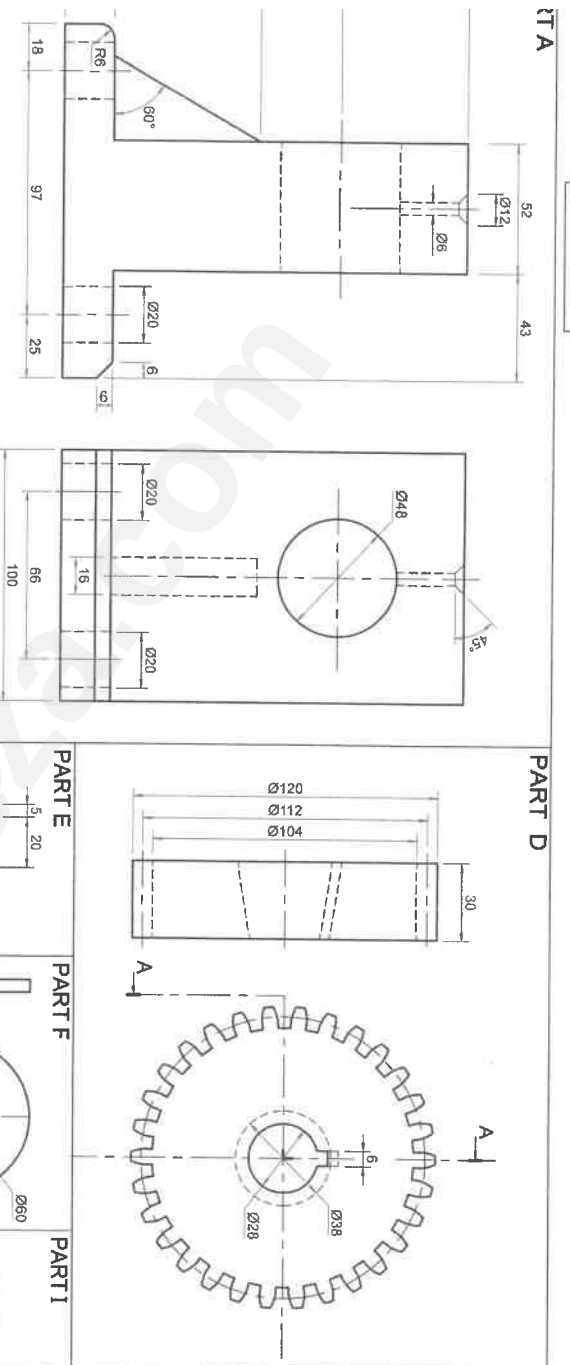
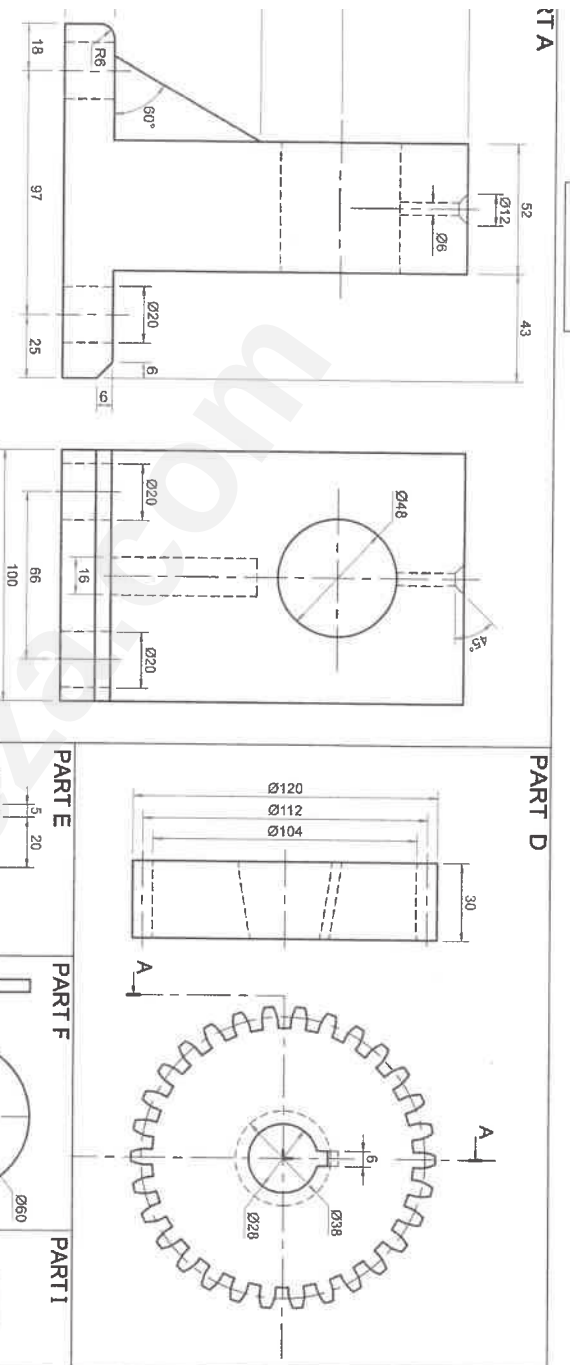
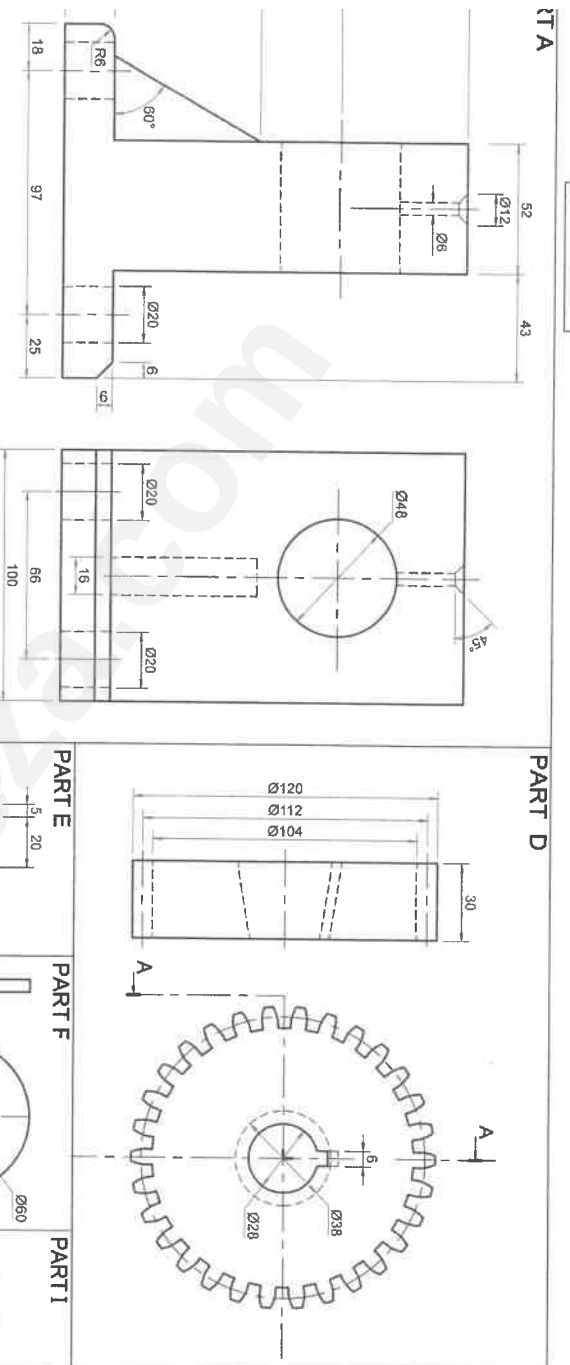
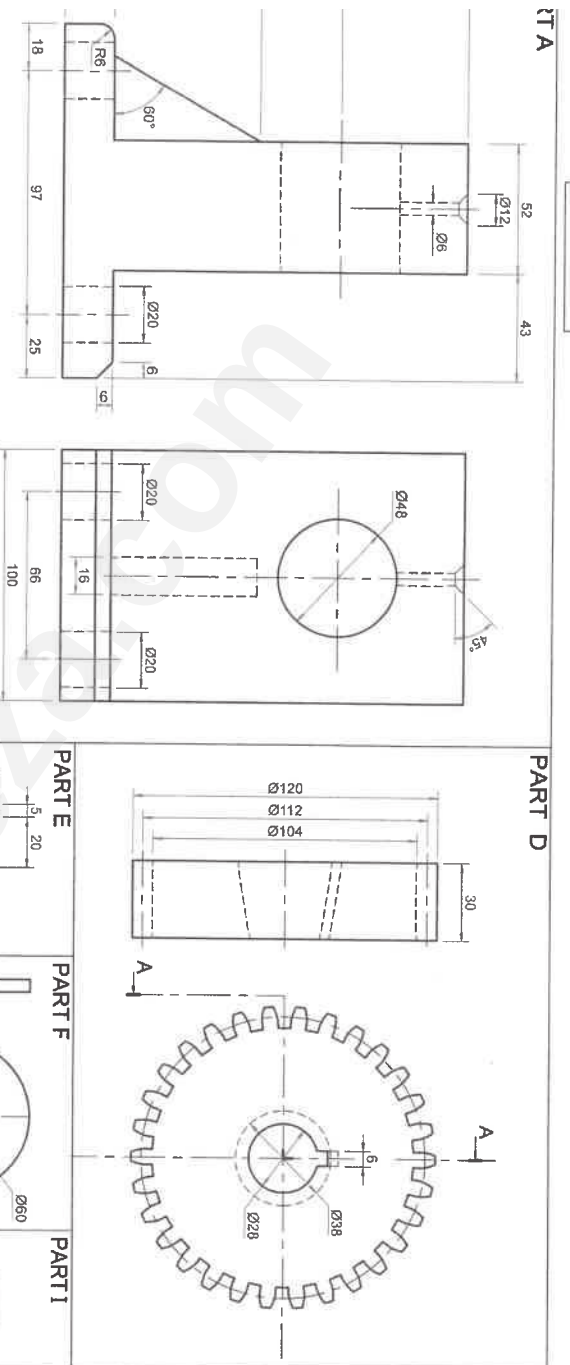
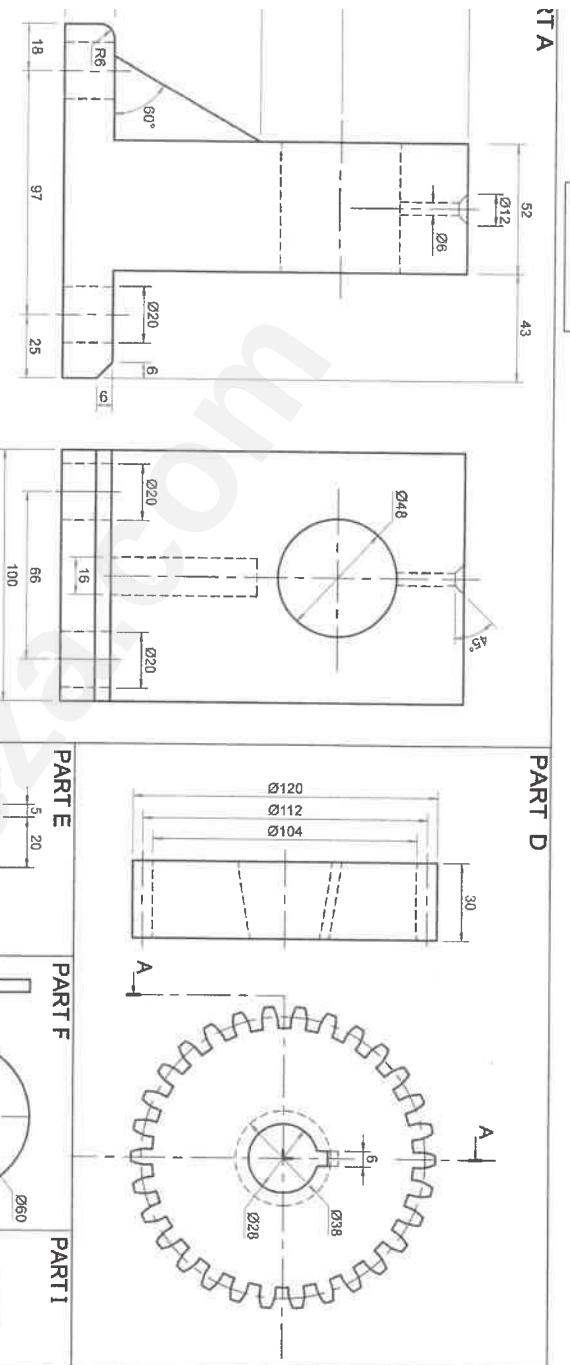
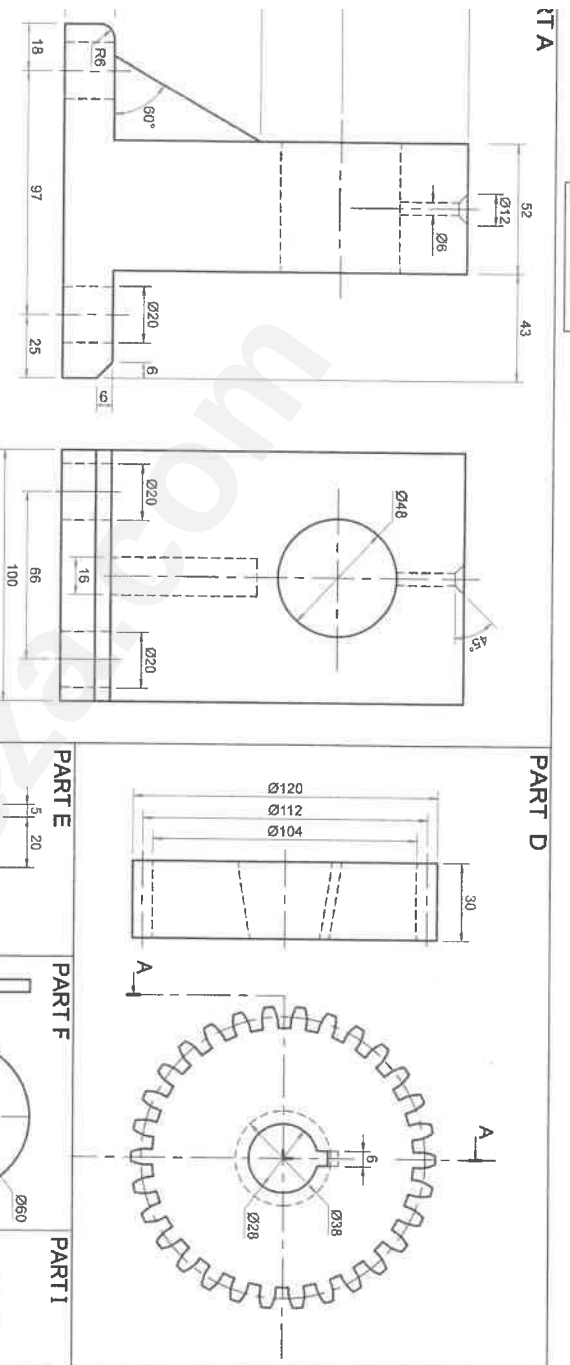
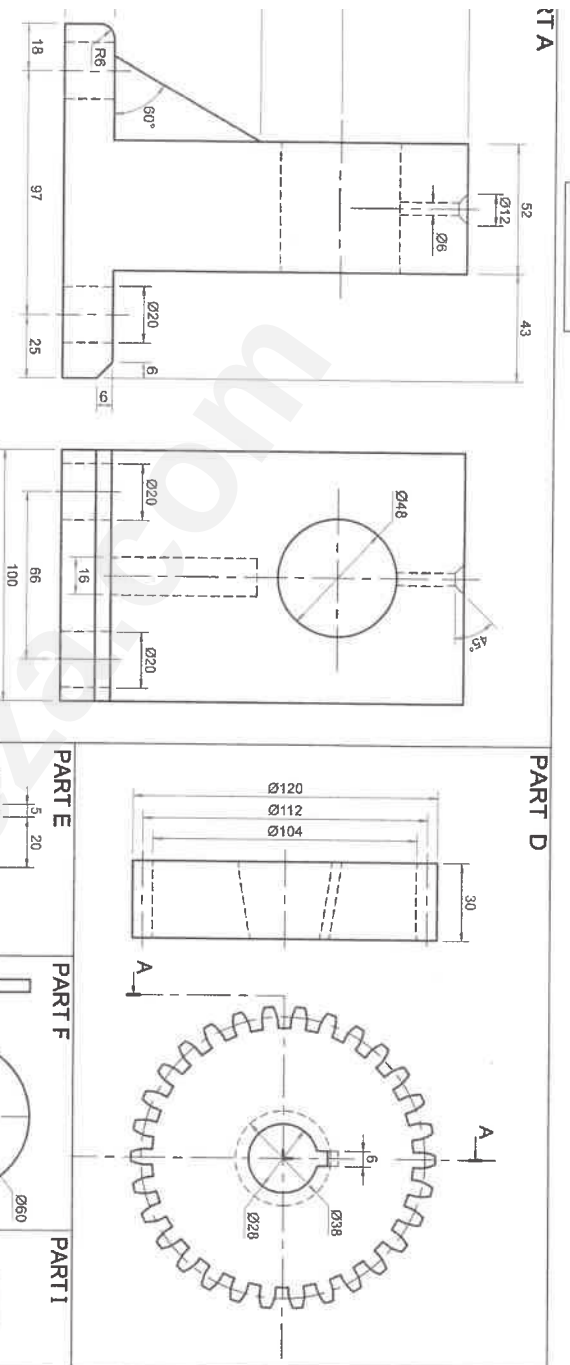
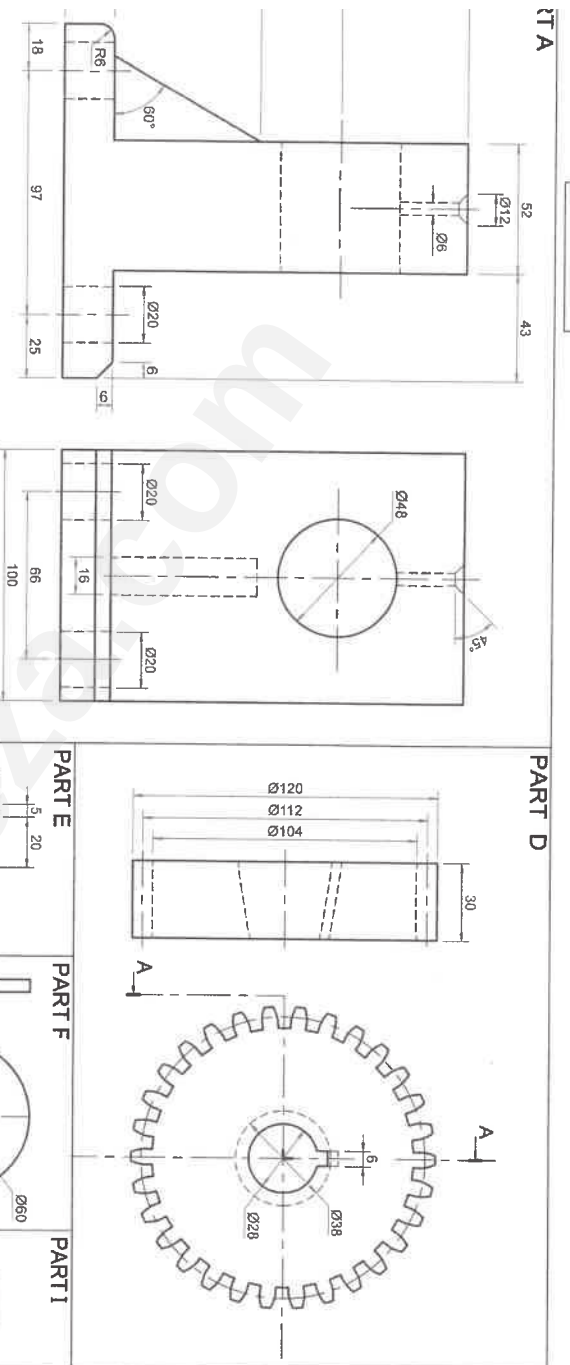
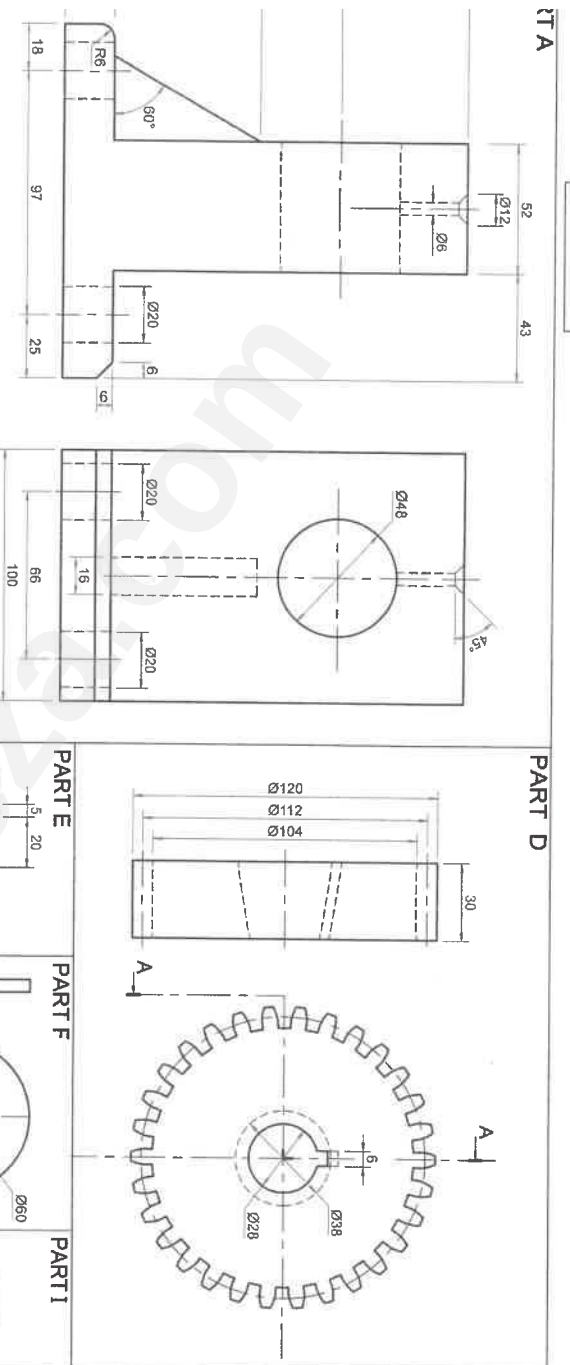
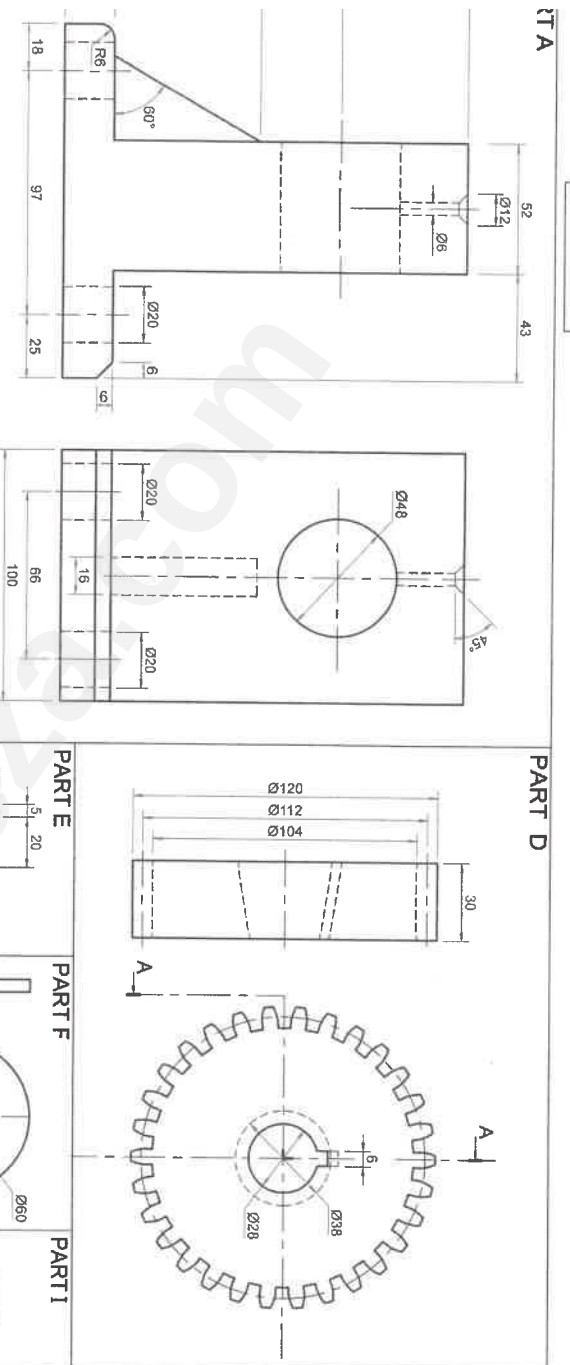
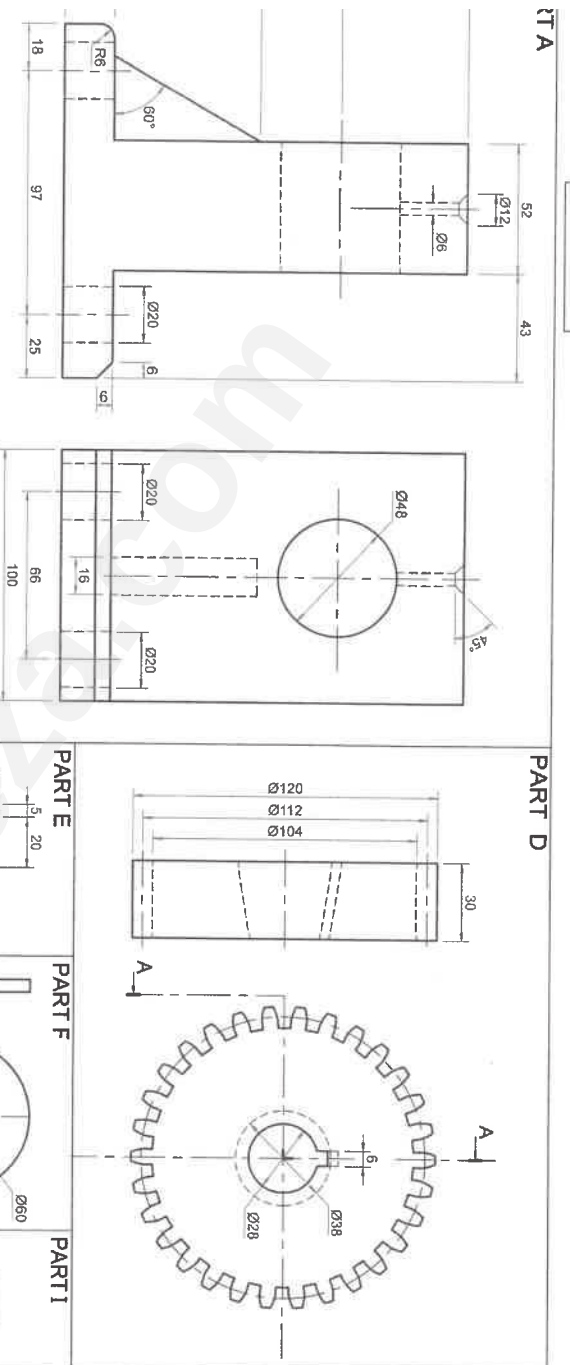
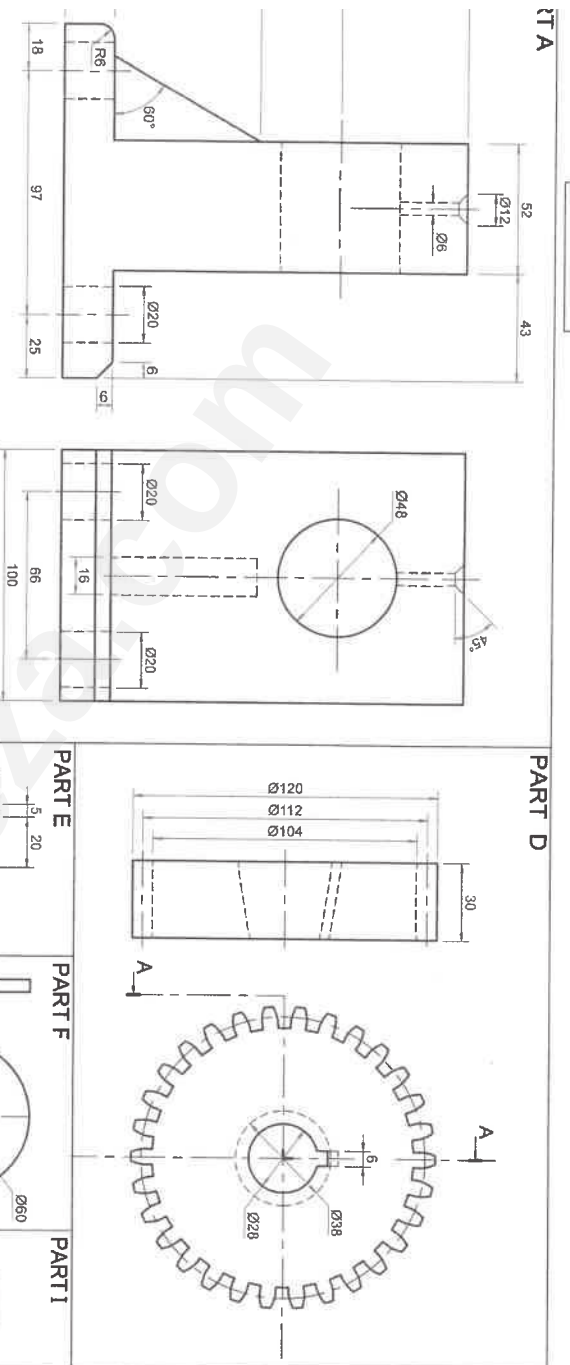
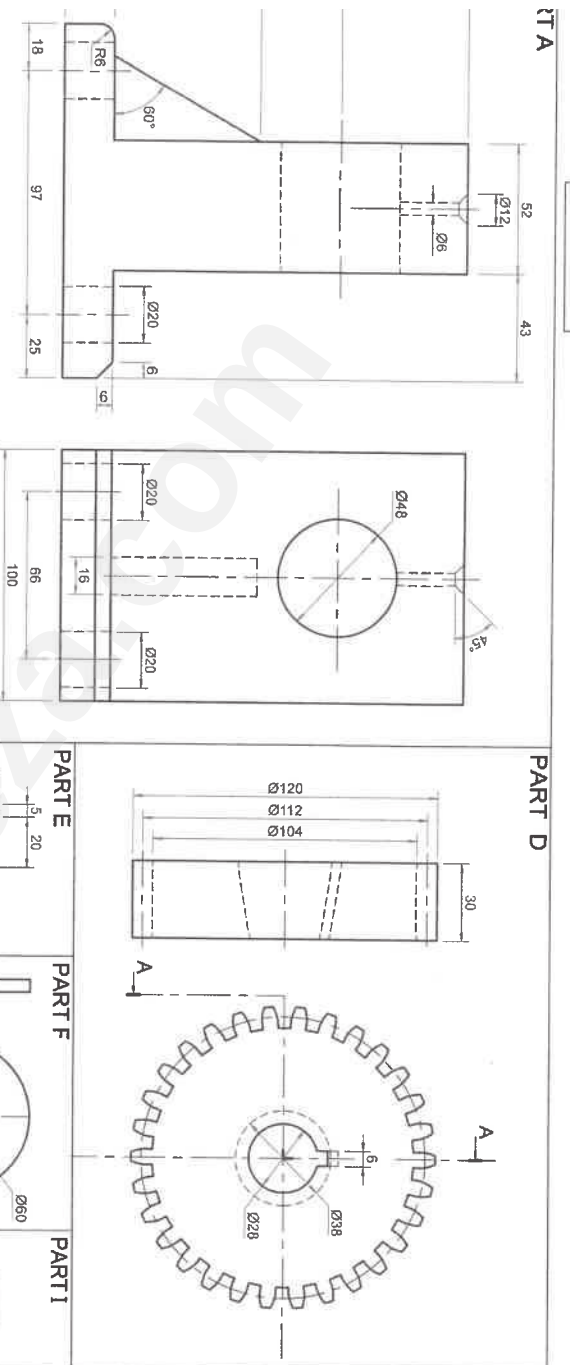
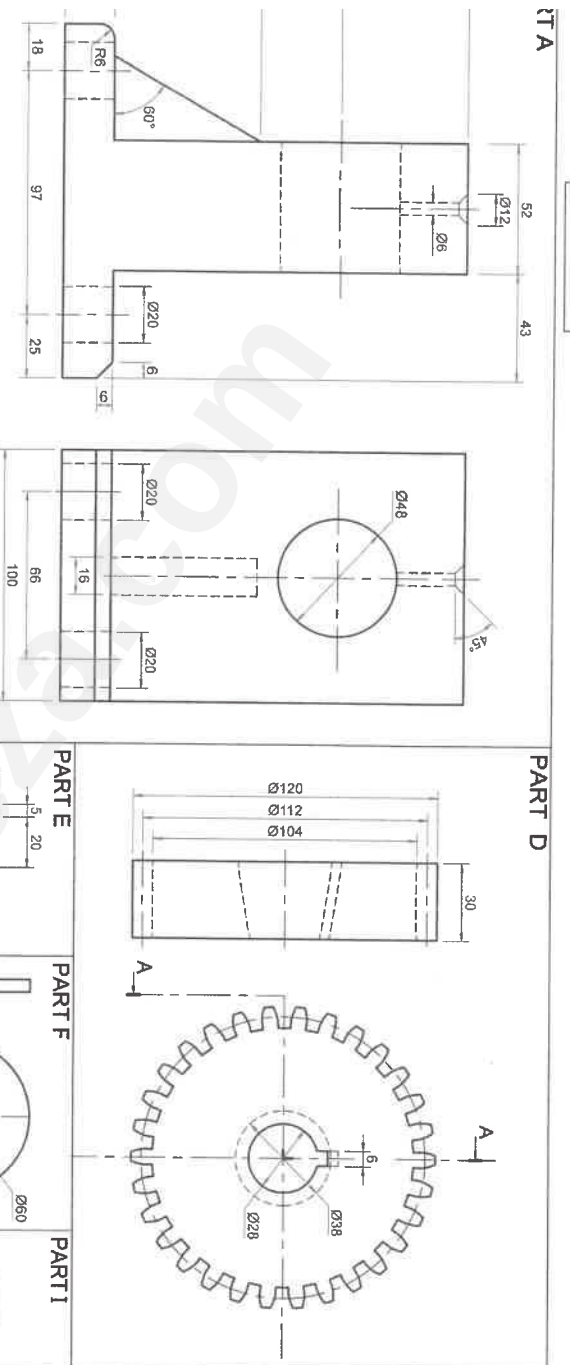
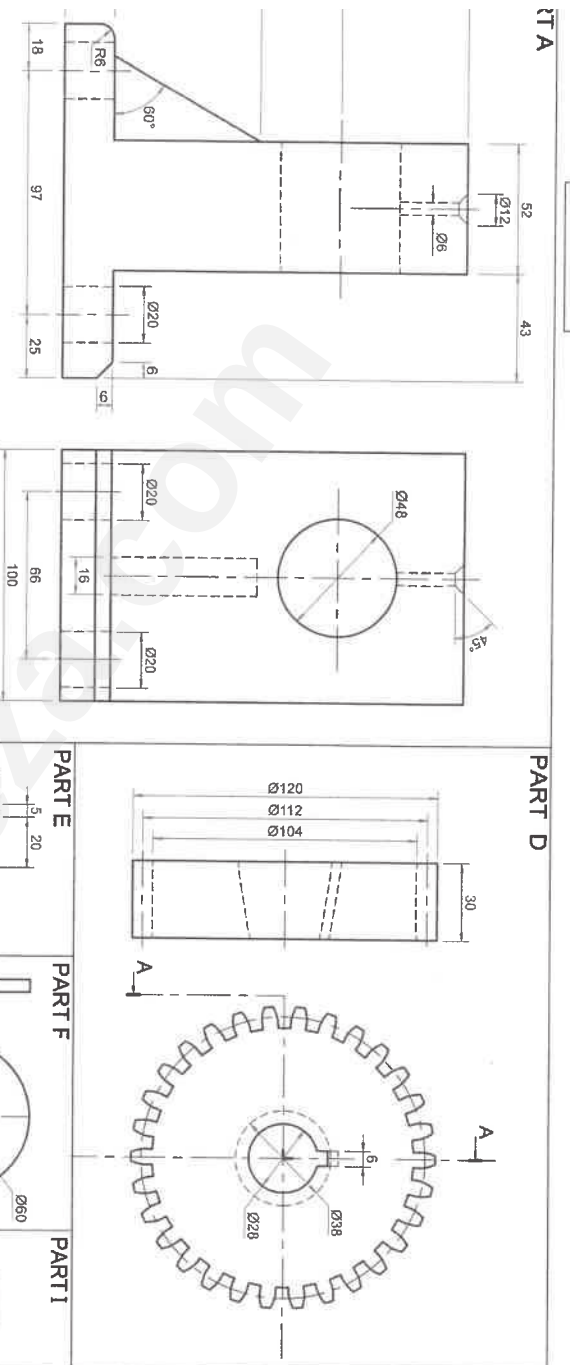
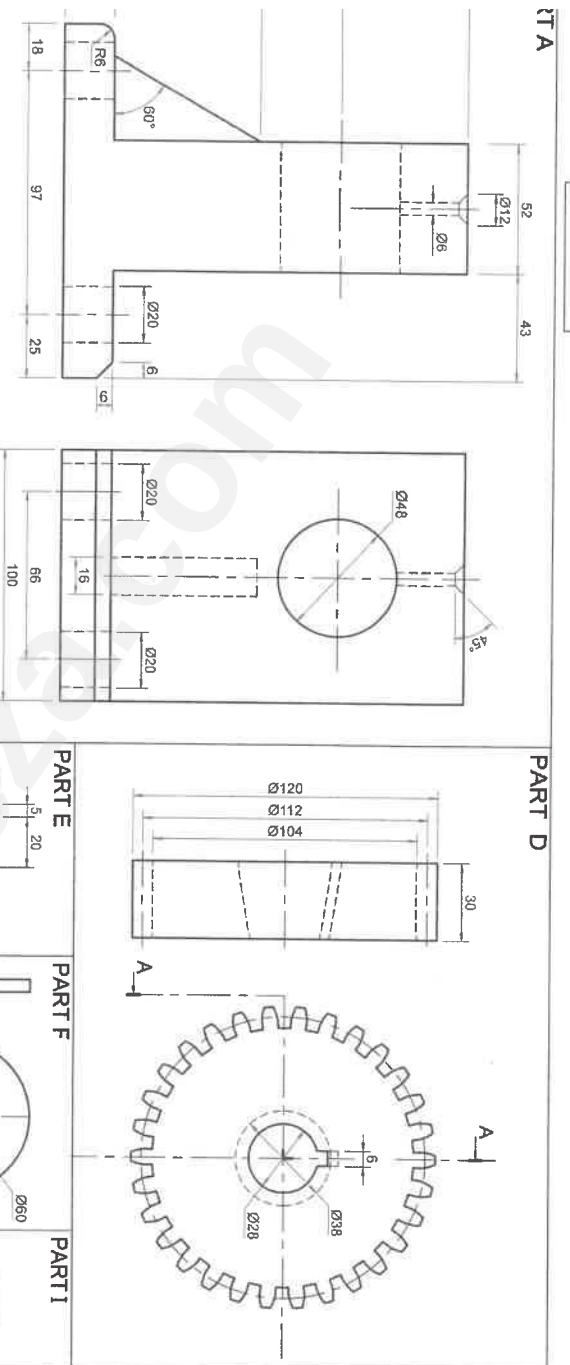
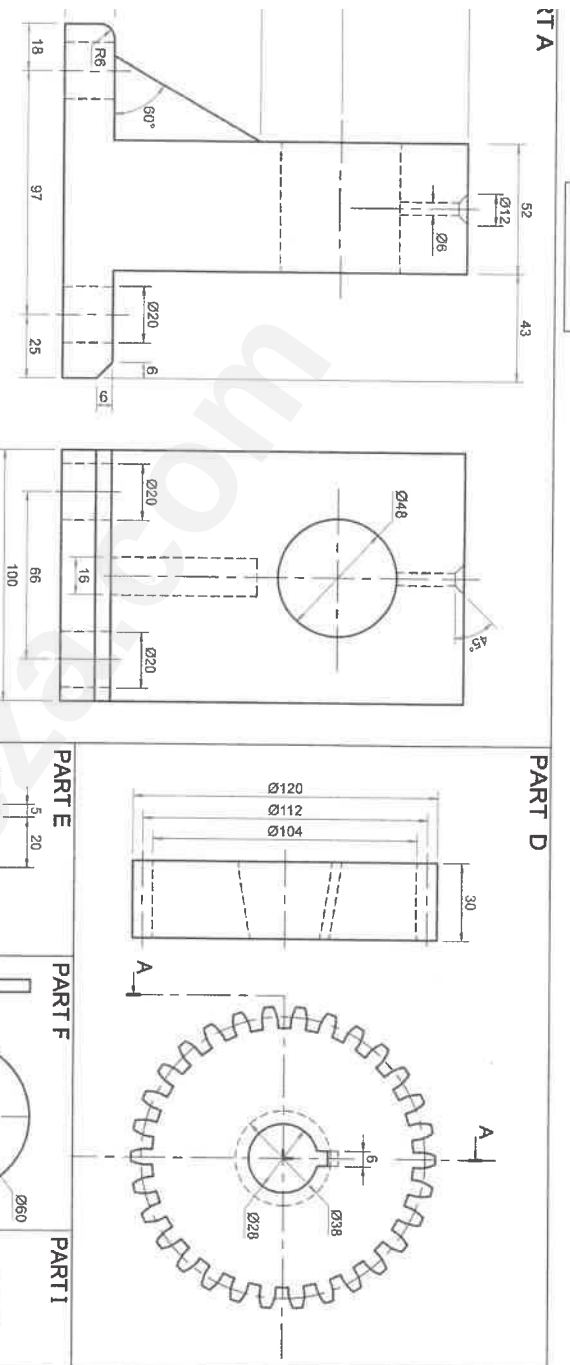
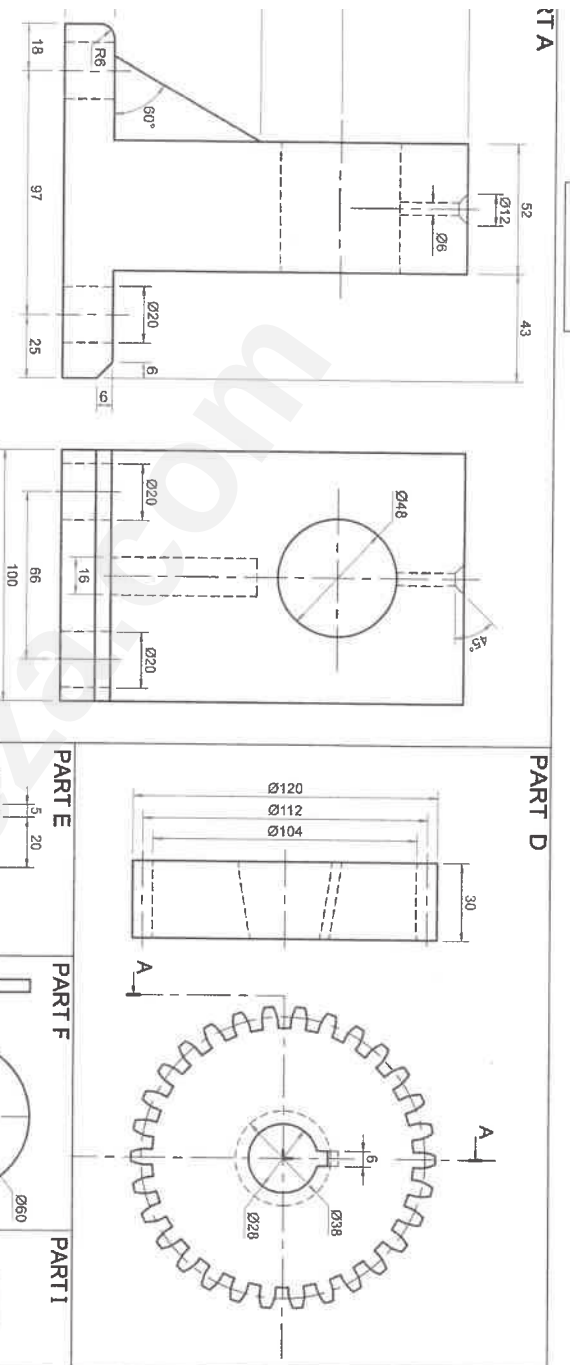
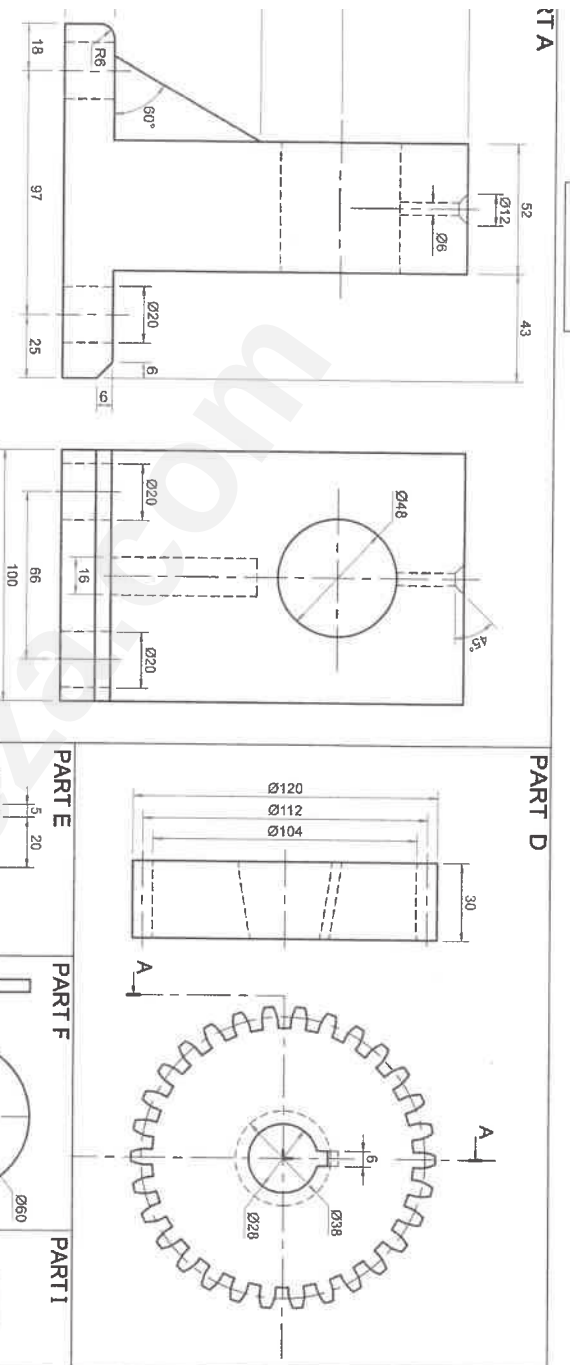
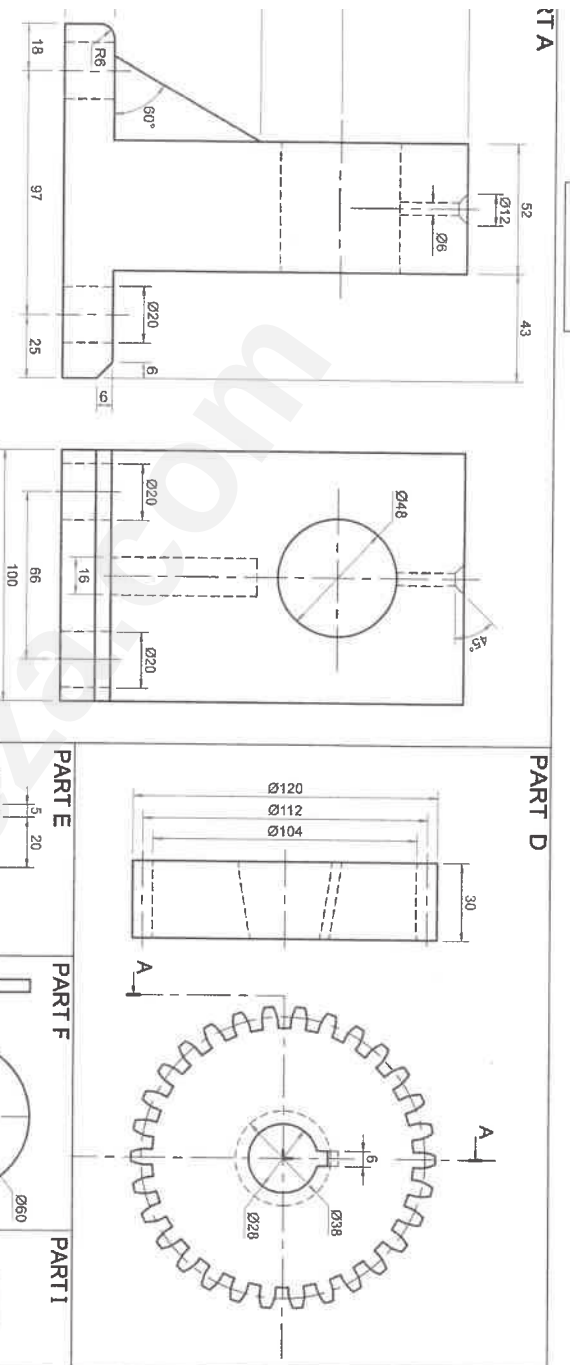
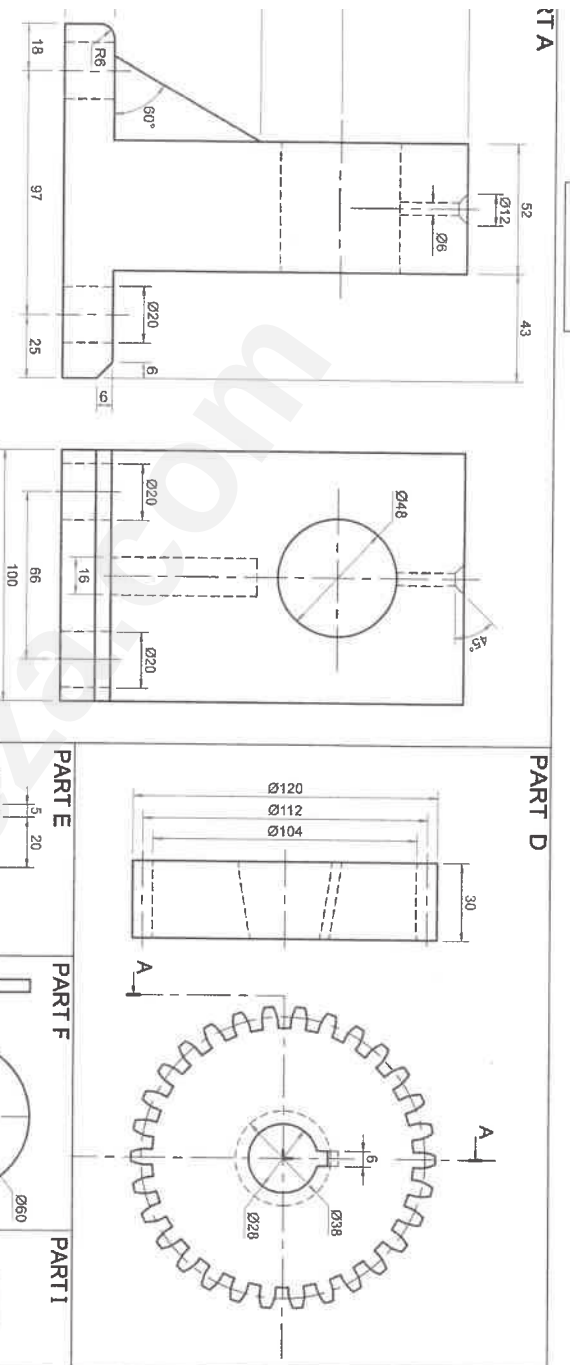
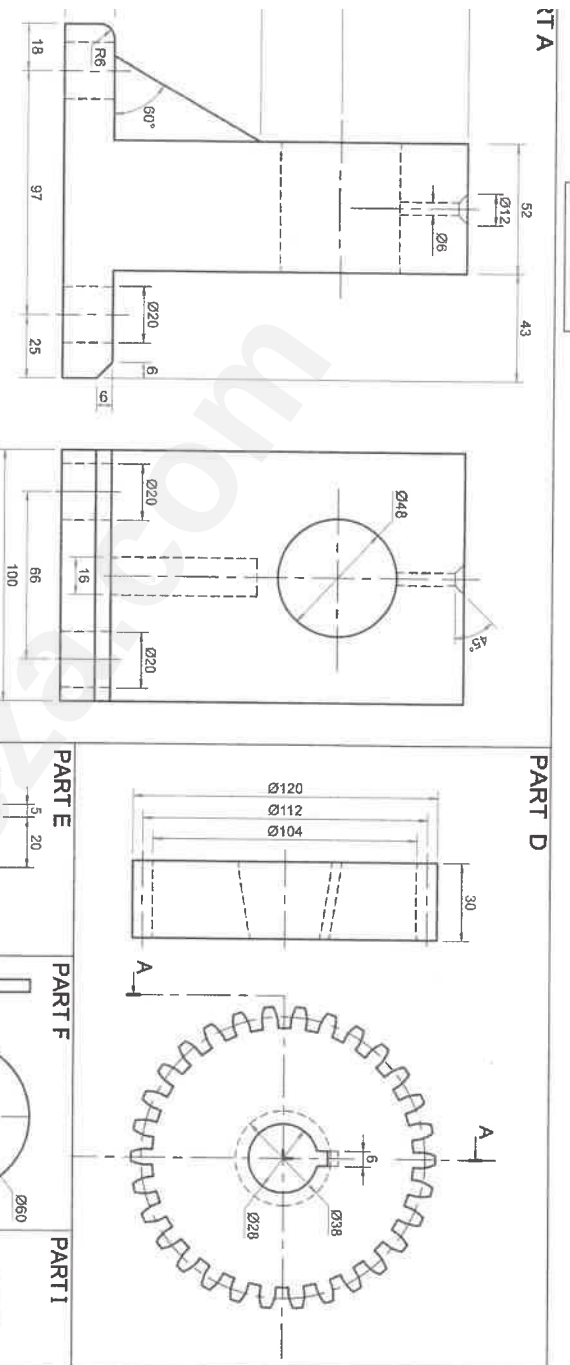
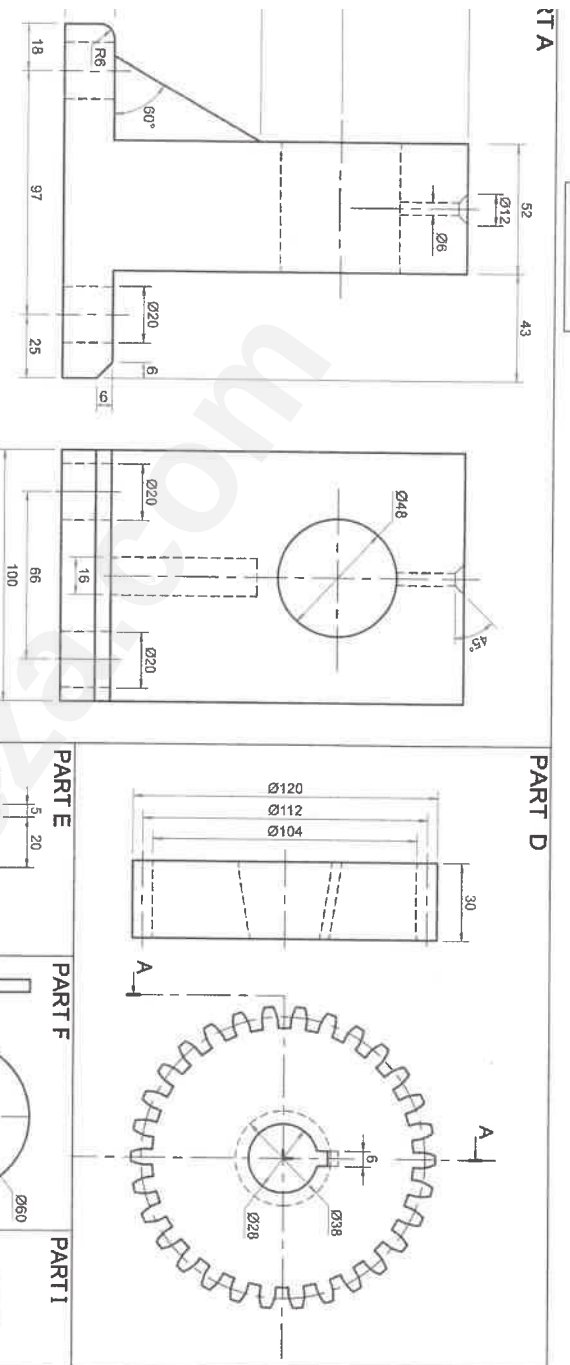
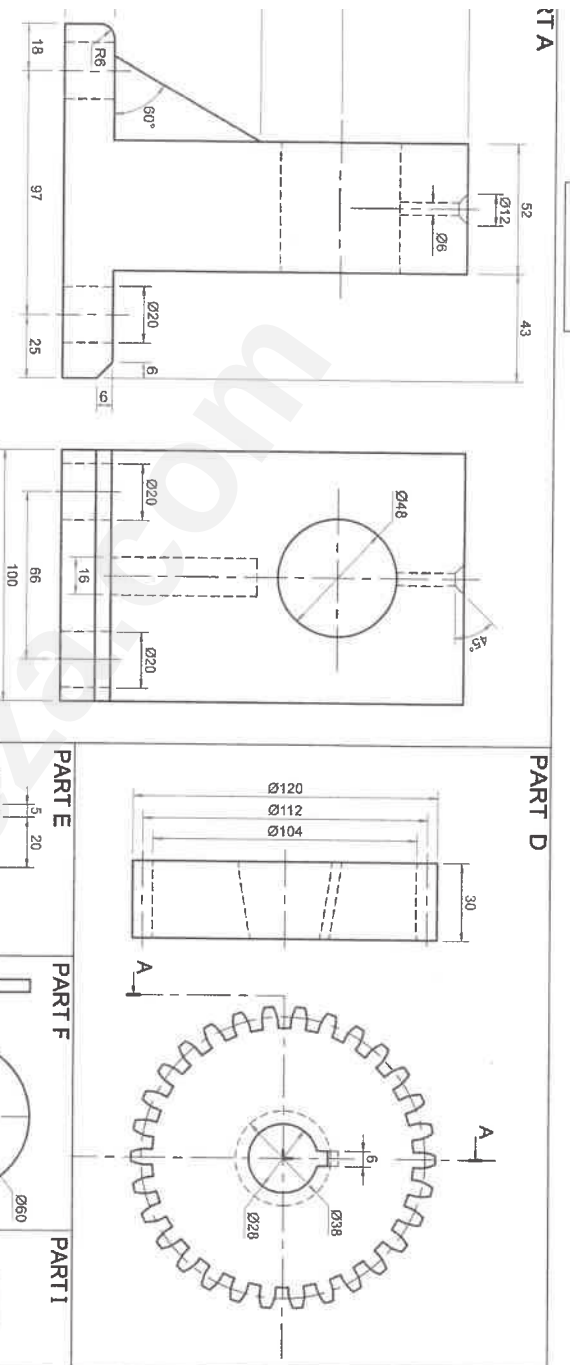
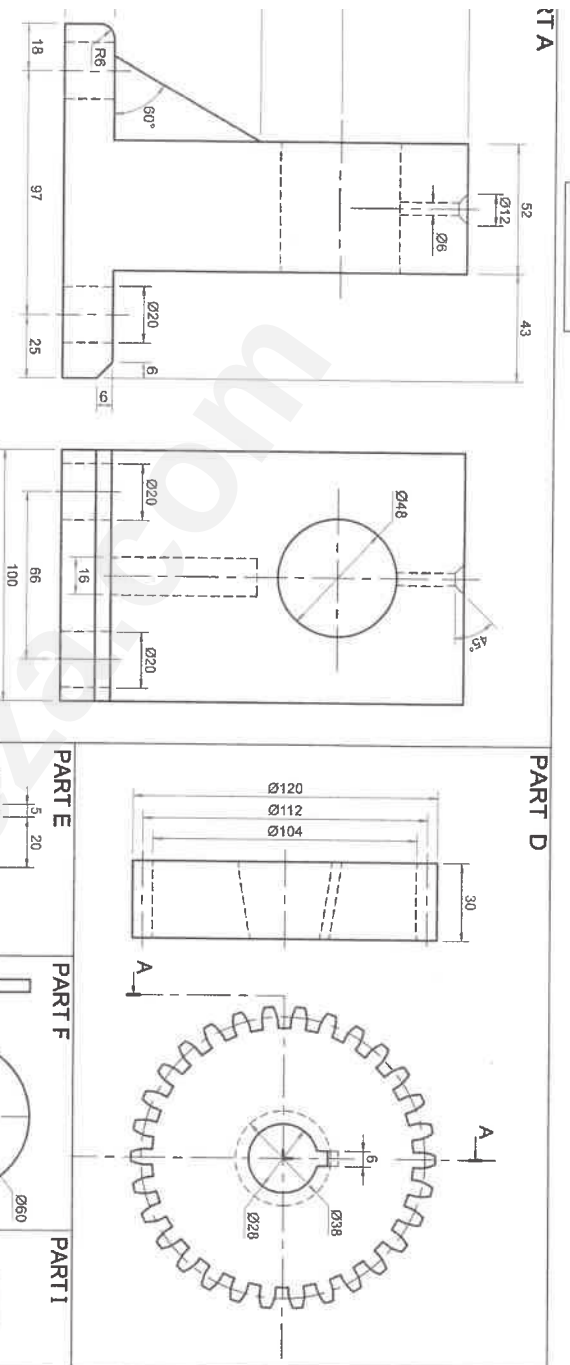
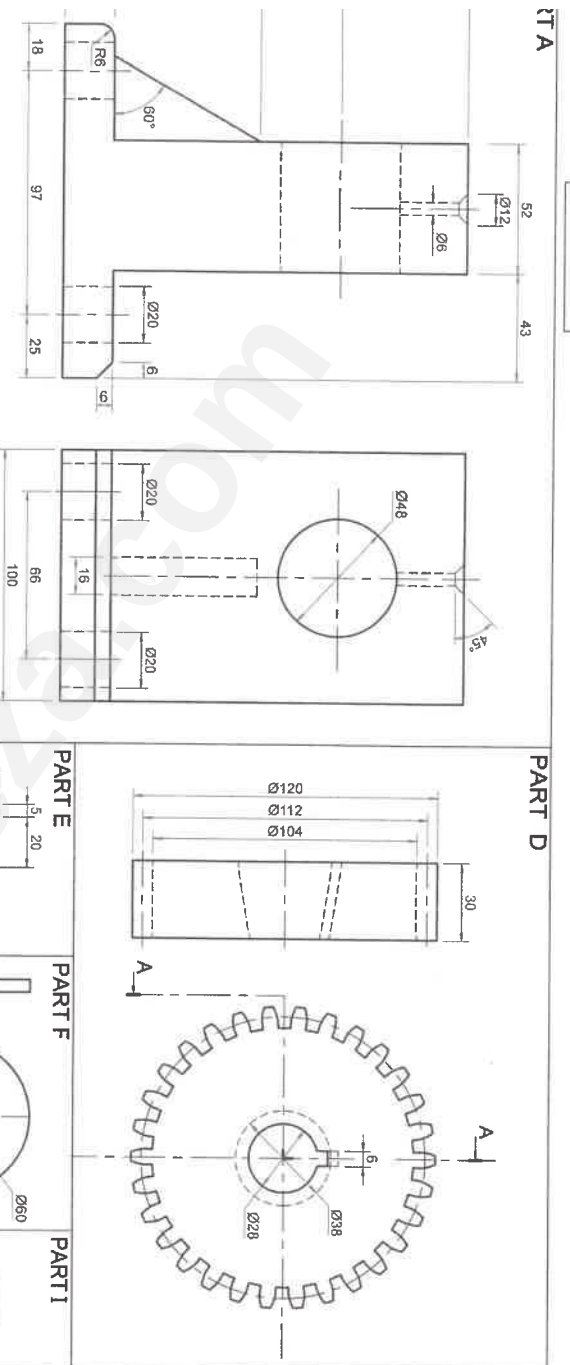
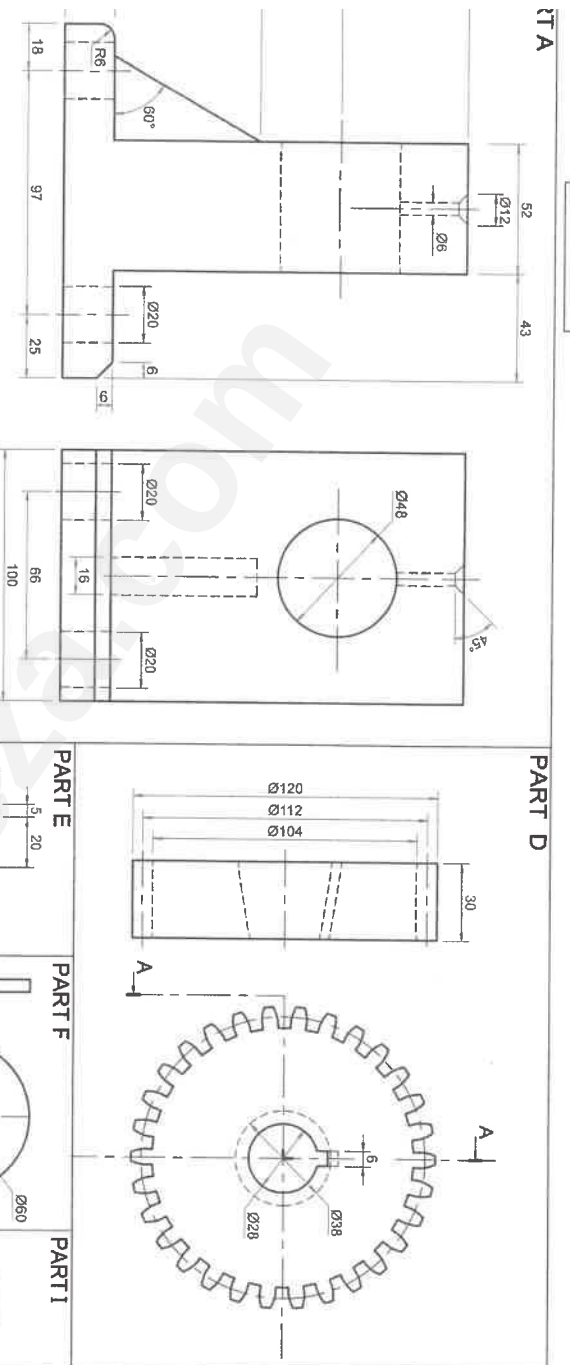
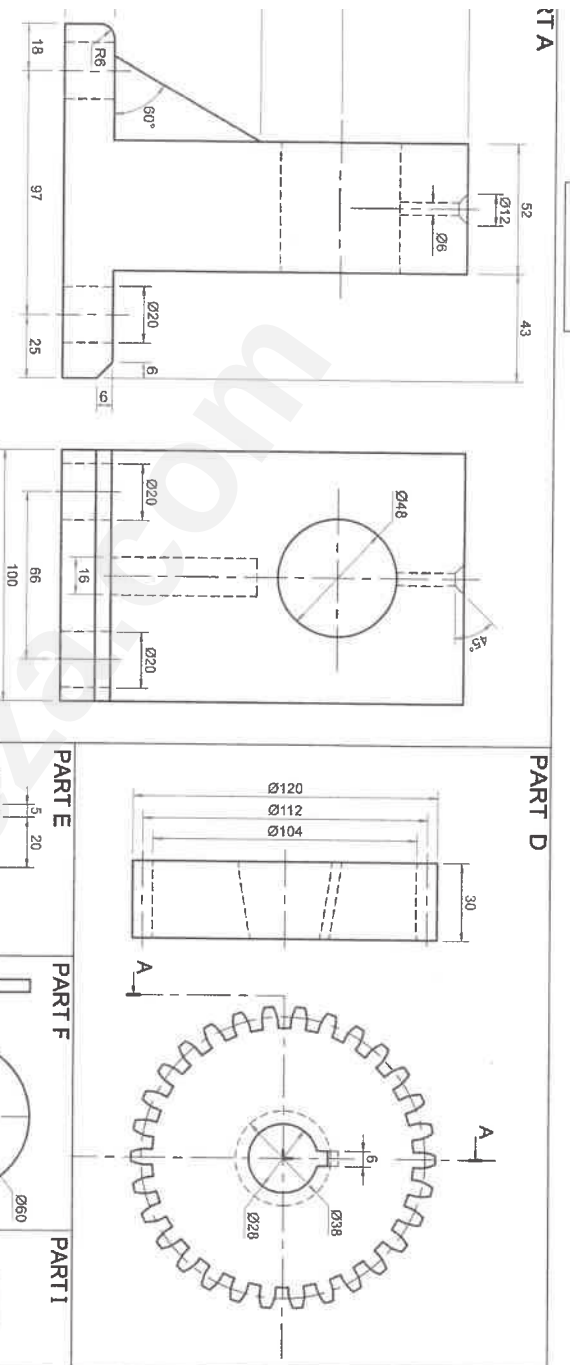
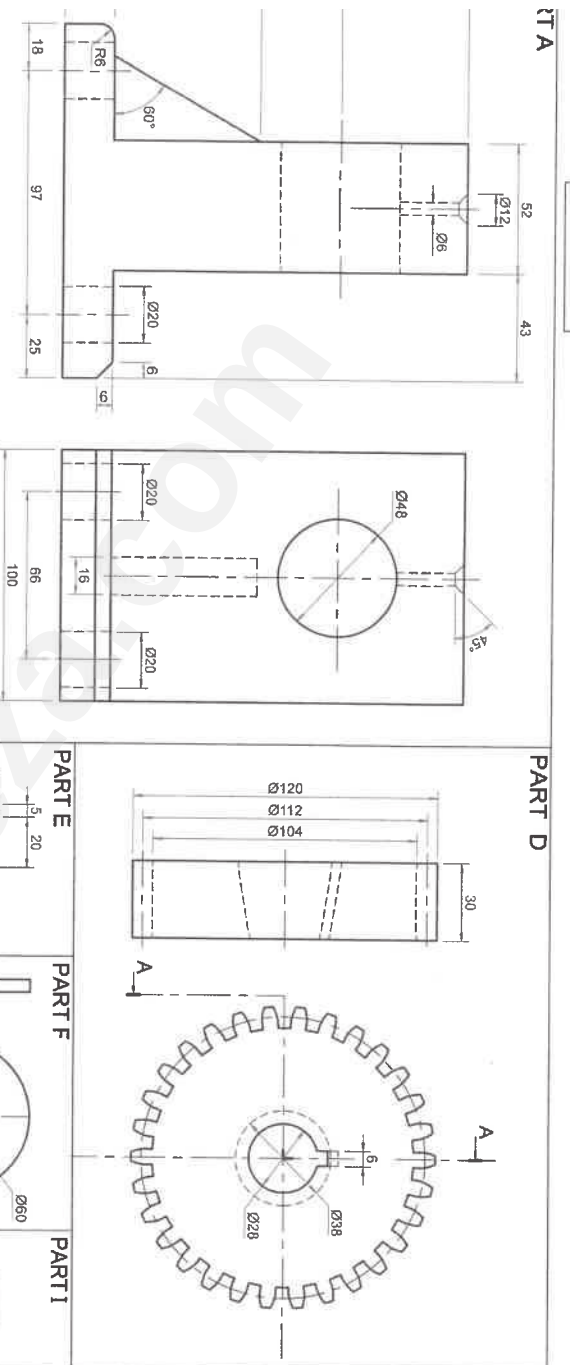
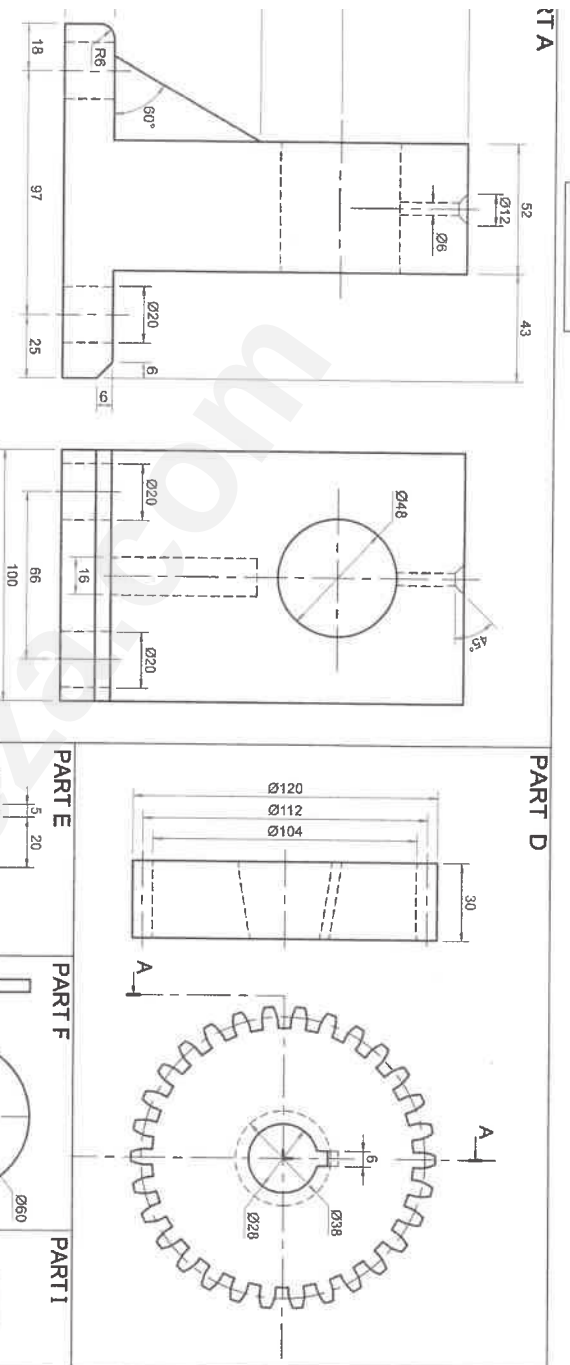
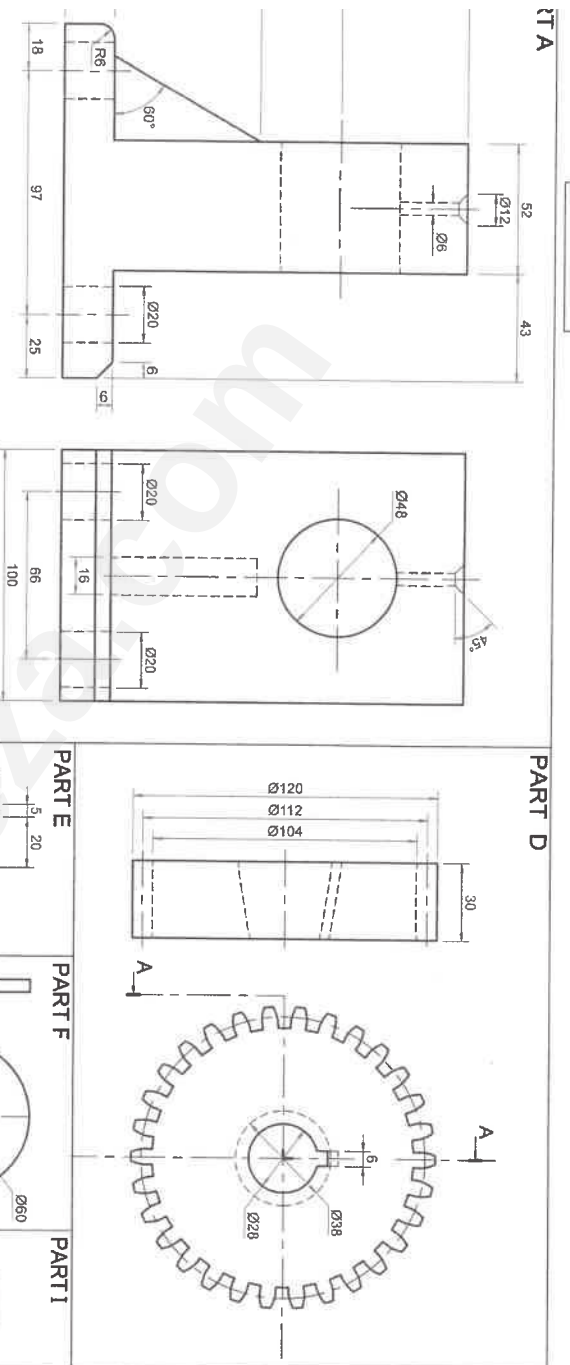
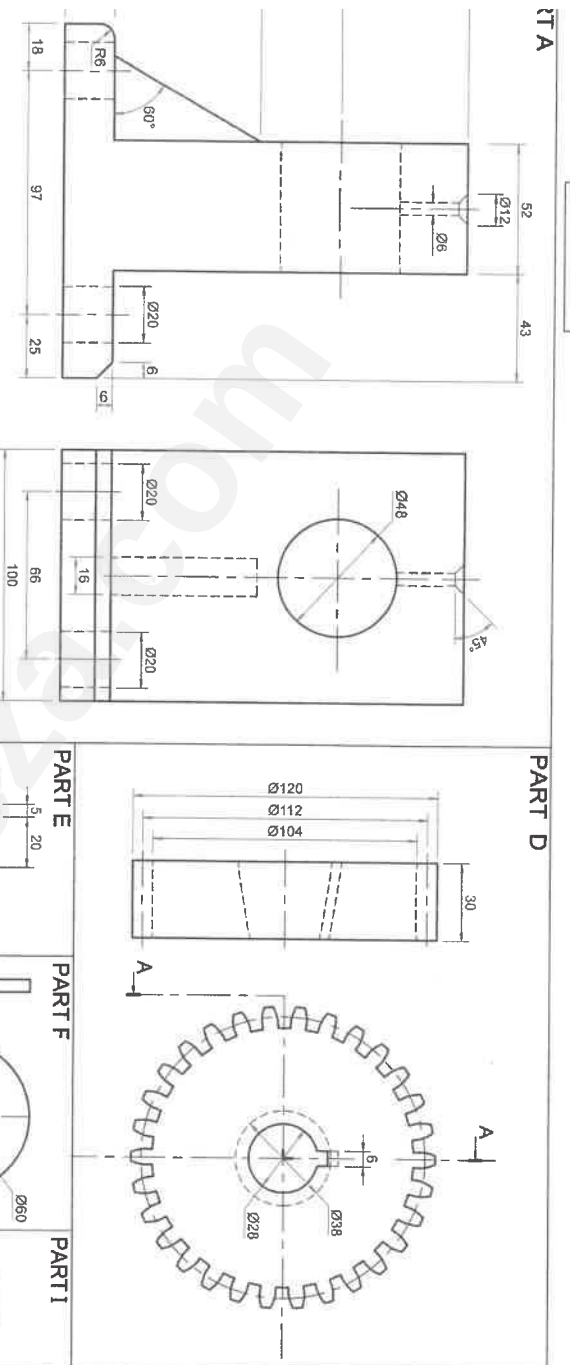
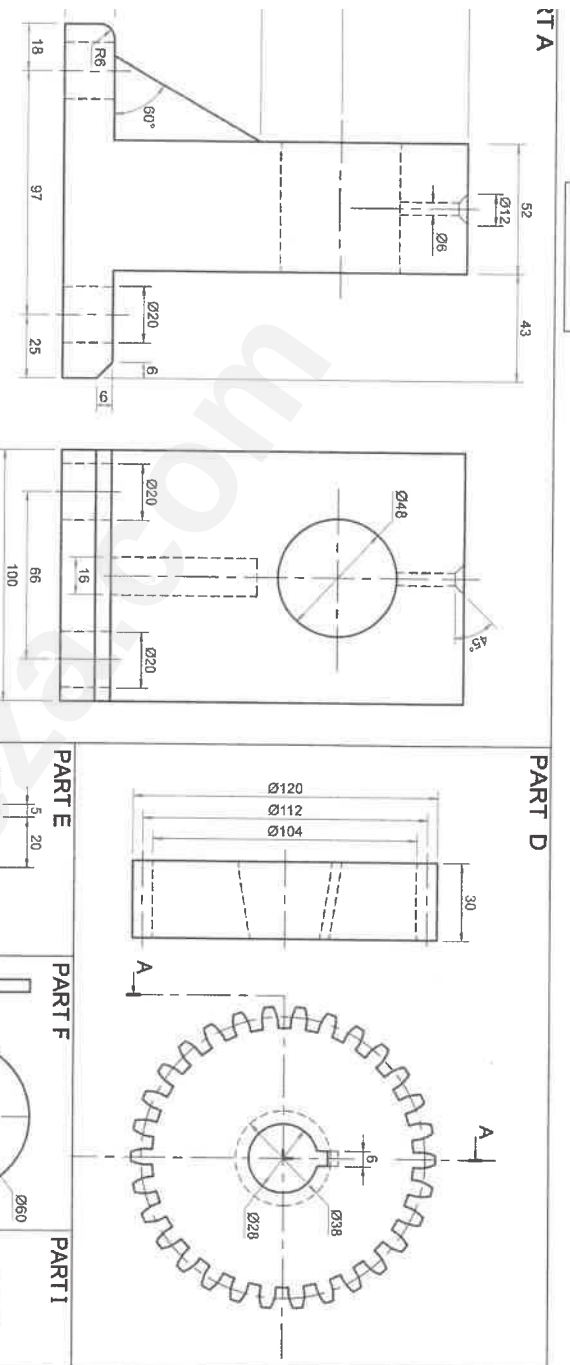
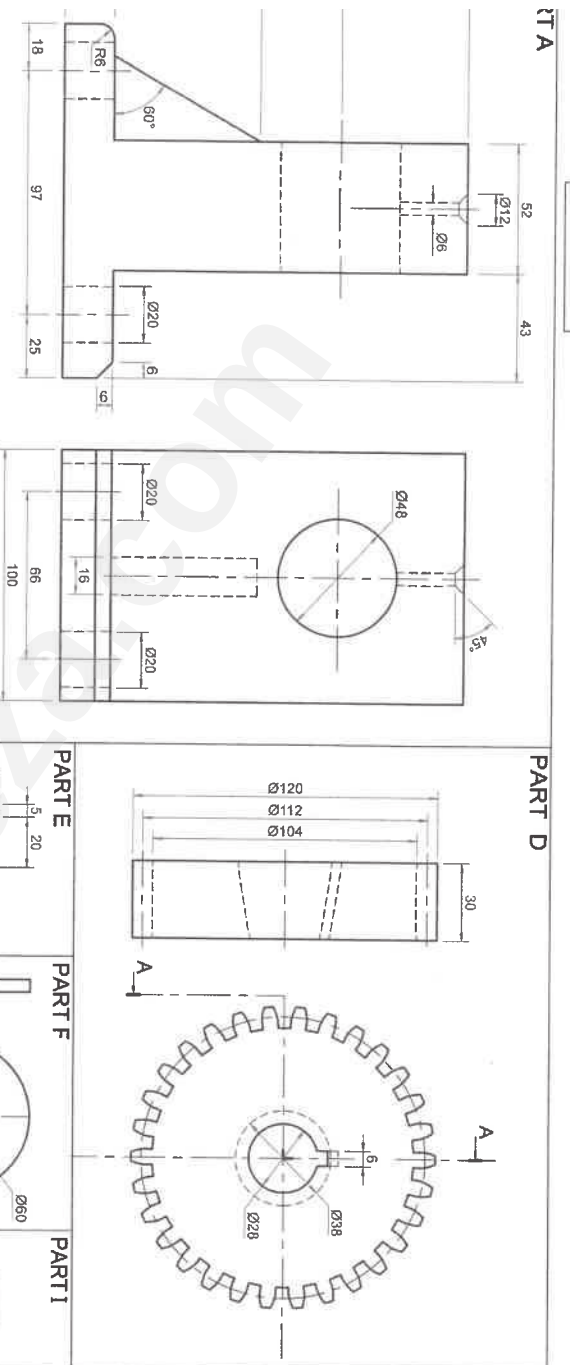
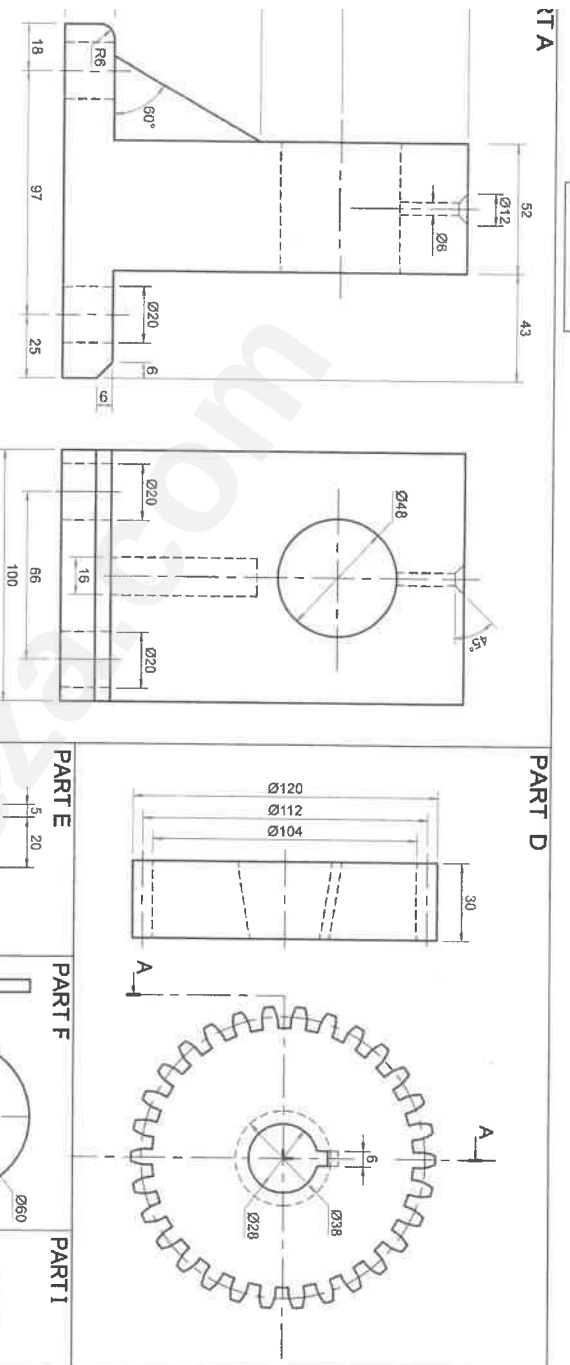
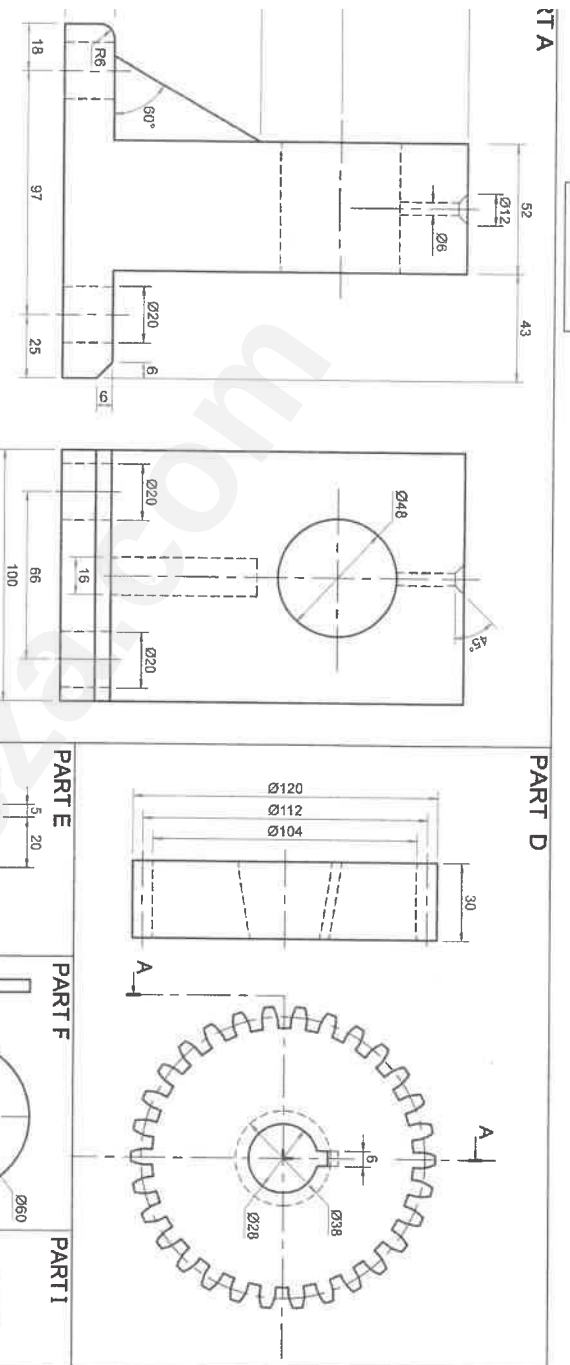
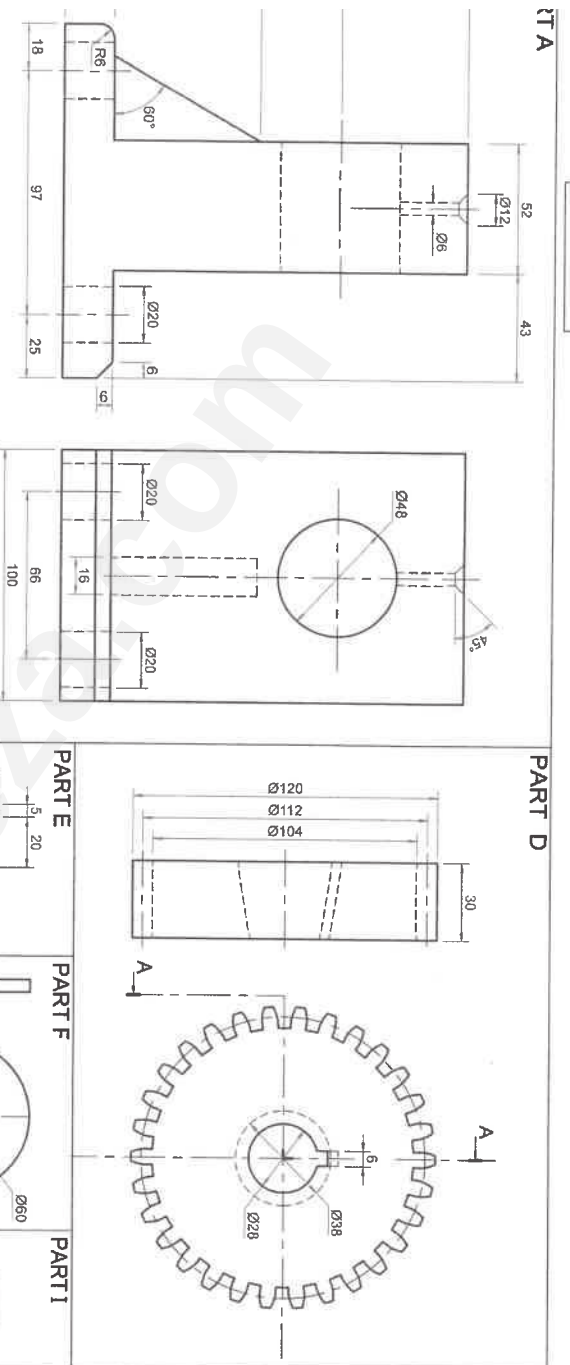
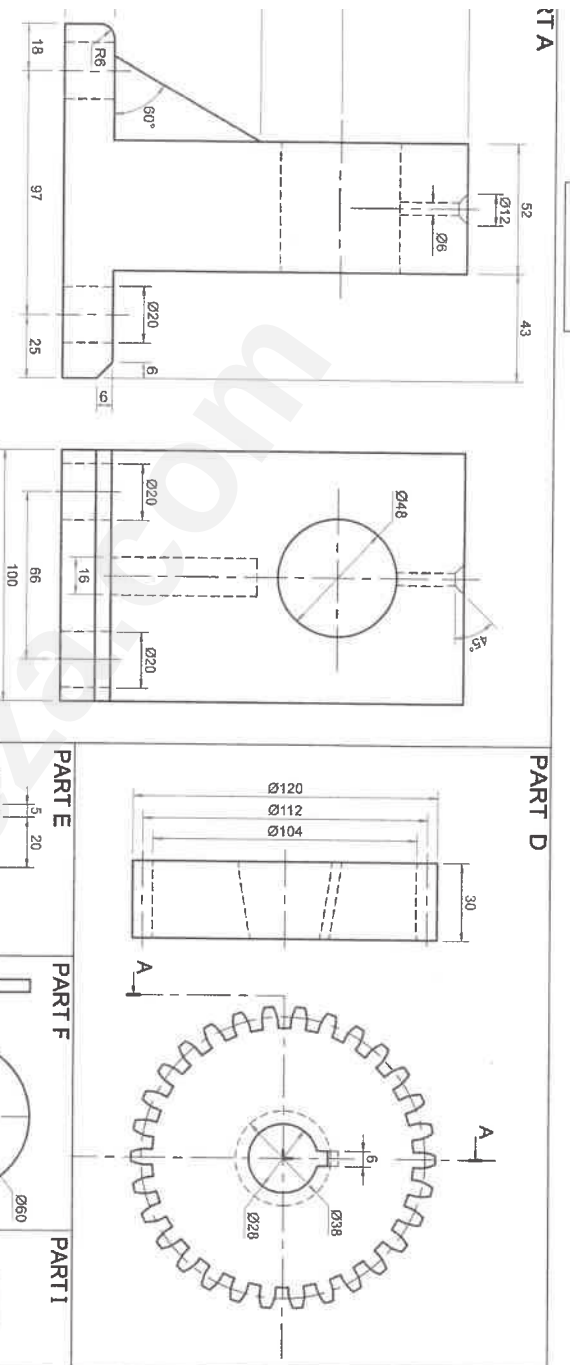
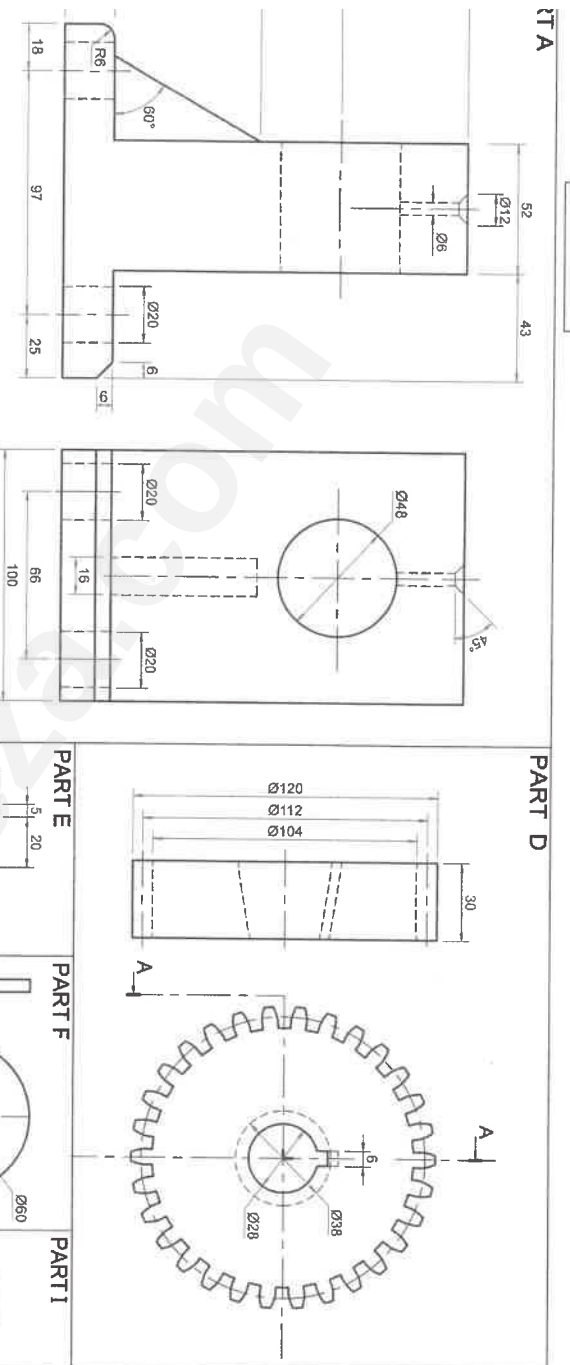
- Constructions 2
- Isometric Points 40/2 20
- Isometric Circles 8
- Centre Lines 2
- Hatching / Non-Hatching 6
- Position 2

CON	2
ISO	40/2
CIRC	8
CLS	2
HAT	6
POS	2

ANSWER SHEET 3

EXAMINATION NUMBER

FIGURE 1



QUEST
MECHA
ASSEI

ASSESSMENT CRITERIA

FRONT VIEW

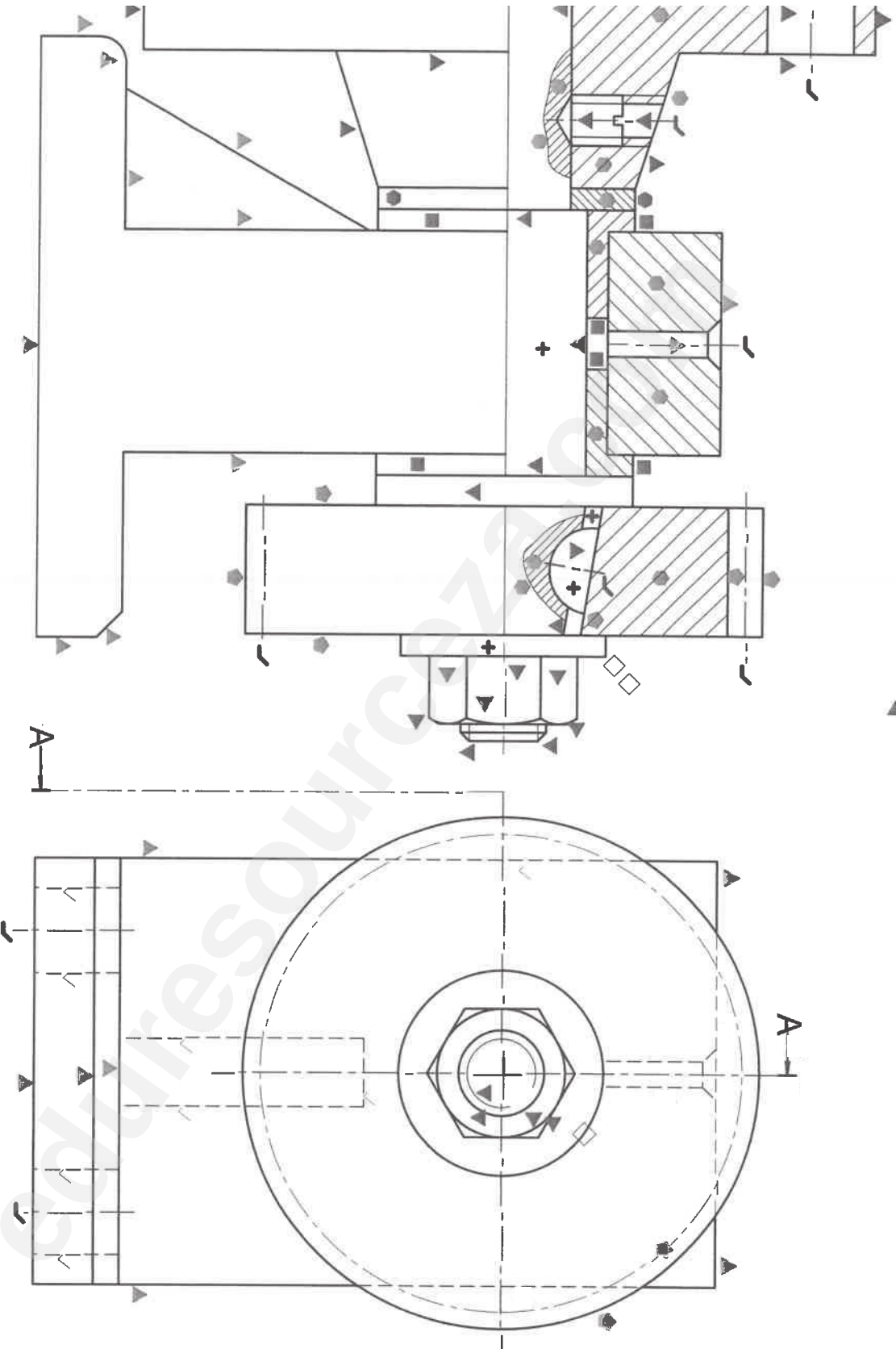
A	HOUSING	
B	COUPLING	
C	SHAFT	
D	GEAR	
E	BUSHES	
F	SPACER	
G	WASHER	
H	M12 SCREW	
I	M16 NUT	
J	KEY	
TOTAL		

RIGHT VIEW

A	HOUSING	
C	SHAFT	
D	GEAR	
G	WASHER	
I	M16 NUT	
HIDDEN DETAIL 12/2		
TOTAL		

ADDITIONAL

CORRECT ASS.		
HATCHING	14/2	
NON-HATCHING	4/2	
CENTRE LINES	8/2	
DIMENSIONS		
CUTTING PLANE	8/2	
SYMBOL		
TITLE/SCALE/LABEL		
TOTAL		
TOTAL		



SECTIONAL FRONT VIEW ON A-A / SECTION A-A

E: INTERMEDIATE SHAFT
AND GEAR
LE: SCALE 1:1



ANSWER SHEET 4

EXAMINATION NUMBER									