Hillcrest High School

GRADE 11 – ENGINEERING GRAPHICS AND DESIGN EXAM

PAPER 2

November 2016

TIME: 3 hours

Examiner: Miss Cousins

TOTAL: 200 marks

Moderator: Mrs Moodley

NB: READ THE INTRUCTIONS

1. This paper consists of 6 pages, and 4 questions.
2. Answer ALL questions.
3. Take note of the mark allocation in each question.
4. The questions must be answered on the answer sheets provided.
5. All the answer sheets must be re-stapled in NUMERICAL sequence and handed in irrespective of whether the question was attempted or not.
6. Time management is essential in order to complete all the questions.
7. Print your Name and Surname in the block provided on EVERY answer sheet.
8. All answers must be drawn accurately and neatly.
9. Any details or dimensions not given must be assumed in good proportion.

Question		Learner Mark	Mark Allocation
1	Mechanical Analytical		30
2	Cam		36
3	Isometric		38
4	Mechanical Assembly		96
	TOTAL		200

Name:

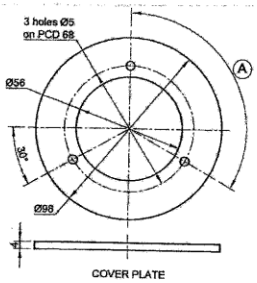
QUESTION 1 – MECHANICAL ANALYTICAL

Given:

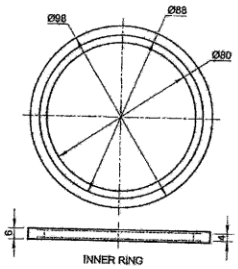
Some parts of a piston, the sectional front view and top view of the assembled parts with a title block and a table of questions

Instructions:

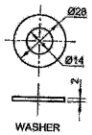
Complete the table below by neatly printing the answers in the space provided, which refer to the accompanying drawings and title block. Show ALL calculations.



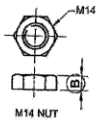
COVER PLATE



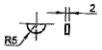
INNER RING



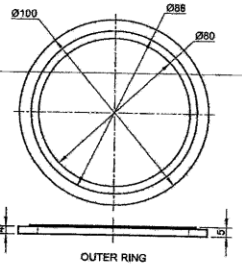
WASHER



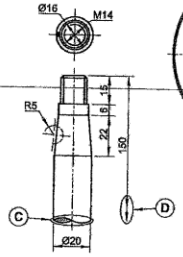
M14 NUT



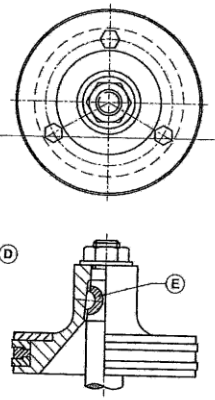
WOODRUFF KEY



OUTER RING



SHAFT



ASSEMBLED VIEWS

	QUESTIONS	ANSWERS	
1	On what date was the drawing first checked?		1
2	What is the file name?		1
3	From what material is the cover plate manufactured?		1
4	Which drawing method was used to create these drawings?		1
5	What is the indicated scale that was used to draw the assembly?		1
6	What is the tolerance allowed on the dimensions?		1
7	On the COVER PLATE, what does the abbreviation 'PCD' stand for?		2
8	Calculate the degree of the angle at A		2
9	If a standard size M14 nut was used, calculate what would the thickness (B) of the nut be?		2
10	What is feature C called?		2
11	What is the reason for the double arrows at D?		2
12	What type of section is shown at E?		1
13	What type of section is shown on the assembly of the piston?		1
14	How many parts are used in the complete assembly of the piston?		1
15	What is the purpose of a key on a shaft in an assembly?		2
16	Was the suggested revision on the drawing implemented?		1
17	Draw the arrows for the cutting plane located on the top view of the assembly and label it A-A.		4
18	In the box below (ANSWER 18), draw in neat freehand, the symbol for the projection system used.		4
		TOTAL	30

PARTS LIST		
PART	QUANTITY	MATERIAL
1. PISTON (not shown)	1	CAST IRON
2. SHAFT	1	MILD STEEL
3. COVER PLATE	1	CAST IRON
4. OUTER RING	2	MILD STEEL
5. INNER RING	1	MILD STEEL
6. WASHER	1	MILD STEEL
7. M14 NUT	1	MILD STEEL
8. M5 BOLT (not shown)	3	MILD STEEL
9. WOODRUFF KEY	1	MILD STEEL

09/01/2013	TULANI	REMOVE KEY ON SHAFT	1		
DATE	CHANGED BY	REVISION DESCRIPTION	№		
ALL DIMENSIONS ARE IN MILLIMETRES.		DRAWING SET NO. 2 OF 3	MATERIAL: VARIOUS		
UNLESS OTHERWISE SPECIFIED, TOLERANCES ON DIMENSIONS ARE ± 0,35.	DRAWN BY: PAULA	FILE NAME: SH-03-2011	HEAT TREATMENT: NONE		
	DATE: 20/11/2012	MICRO STEEL MANUFACTURING		SUTTON ROAD SYDENHAM 6001 www.microsteel.co.za	
ALL UNSPECIFIED RADII ARE R3.	CHECKED BY: PETER				
	DATE: 30/11/2012				
DRAWING PROGRAM: AUTOCAD 2013	APPROVED BY: CHRIS	PISTON			
	DATE: 14/12/2012				
	SCALE: 1 : 2				

ANSWER 18

Name:

QUESTION 2 – LOCI (CAM)

A toy manufacturing company wishes to design a toy car that when it is pushed along the ground, the body of the car rises and falls. This can be achieved by attaching a cam to the inside of the wheel with a wedge-follower attached to the body of the car.

The specifications for the movement are as follows:

- The car rises with uniform motion to a height of 23mm over the first 90°
- There is a dwell period for the next 60°
- It then rises a further 37mm over the next 75°
- There is another dwell period for the next 60°
- The car returns to its original position over the final 75°

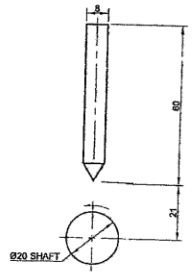
Given:

The cam shaft and the follower detail in its lowest position. The cam rotates in an anti-clockwise direction as shown by the arrow.

Instruction:

- Copy the camshaft and follower detail. Show the arrow indicating the direction of rotation.
- Draw a displacement graph with a horizontal scale of 30° equal to 8mm and a vertical scale of 1:1 for the given motion. Label the graph and include a scale.
- Project and draw the cam profile that would generate the given motion.

Show ALL necessary construction and fold lines. **[36]**



CAMSHAFT AND FOLLOWER DETAIL

ASSESSMENT CRITERIA	
GRAPH	9
GIVEN INFO: FOLLOWER, MIN HEIGHT DIRECTION ARROW SHAFT and CL,s	11
CONSTRUCTION	4
. . . CAM : POSITIONS + CURVE QUALITY	12
TOTAL	36

Name:

QUESTION 4 – MECHANICAL ASSEMBLY

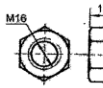
Given:
* The exploded isometric drawing of the parts of a spur gear assembly, showing the position of each part relative to all the others
* Orthographic views of each of the parts of the spur gear assembly

Instructions:
* Answer this question on page 6
* Draw, to scale 1 : 1 and in third-angle orthographic projection, the following views of the assembled parts of the spur gear assembly:

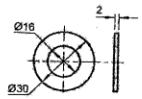
A sectional front view on cutting plane A-A, as seen from the direction of the arrow shown on the exploded isometric drawing. The cutting plane, which passes through the vertical centre line of the assembly, is shown on the left view of the bracket (part 3).

NOTE:
* Show THREE faces of the M16 nut and ALL necessary construction.
* Draw the conventional representation of the spur gear in accordance with the *SANS 10111*.
* NO hidden detail is required.

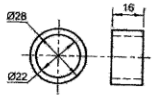
Add the following features to the drawing:
* The cutting plane A-A
* Label the sectional view SECTION A-A



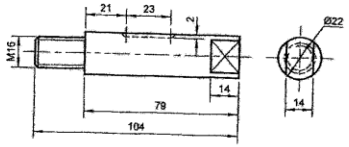
M16 NUT (1)



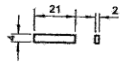
WASHER (2)



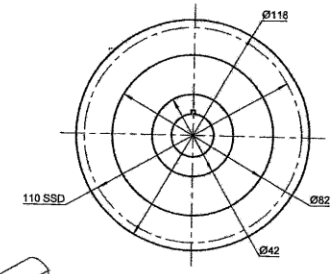
BUSH (5)

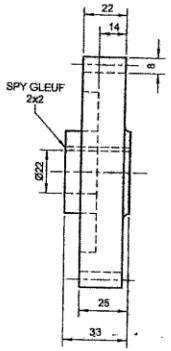


SHAFT (6)

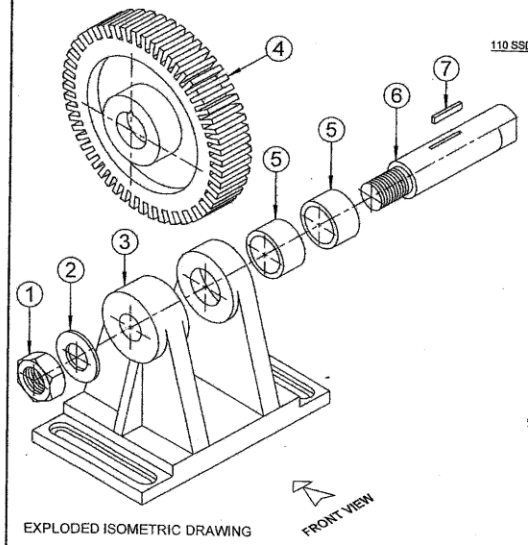


KEY (7)

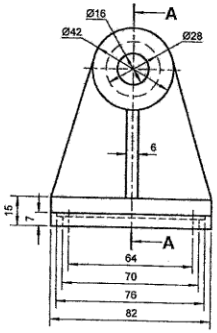


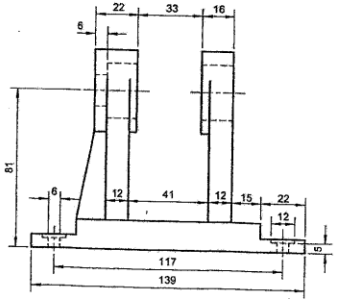


SPUR GEAR (4)



EXPLODED ISOMETRIC DRAWING





BRACKET (3)

PARTS LIST			
	PART	QUANTITY	MATERIAL
1	M24 NUT	1	MILD STEEL
2	WASHER	1	SPRING STEEL
3	BRACKET	1	CAST IRON
4	SPUR GEAR	1	MILD STEEL
5	BUSH	2	BRONZE
6	SHAFT	1	MILD STEEL
7	KEY	1	MILD STEEL

EGD ENGINEERS	JP	7 AVENUE BLIKKIESDORP VRYBURG 0084 082 345 6789
SPUR GEAR ASSEMBLY		
ALL DIMENSIONS ARE IN MILLIMETRES	ALL UNSPECIFIED RADII ARE R3	

Name:

ASSESSMENT CRITERIA		
NUT	10	
WASHER	2	
SHAFT	14	
BRACKET	16	
GEAR	12	
KEY	2	
BUSH	4	
SECTIONING	16	
ASSEMBLY	8	
CENTRE LINES	5	
LABEL AND SCALE	3	
SYMBOL	4	
TOTAL	**96**	

Name: