



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (MECHANICAL ENGINEERING)

EMM 104: MECHANICAL WORKSHOP PROCESSES AND PRACTICES I

DATE: 26/3/2021

TIME: 8.30-10.30 AM

INSTRUCTIONS

ANSWER QUESTION ONE IN SECTION A AND ANY OTHER TWO QUESTIONS IN SECTION B

SECTION A

QUESTION ONE- 30 MARKS (COMPULSORY)

- a) The fork end in figure 1 is to be fabricated in the workshops out of a flat bar work piece of the dimension 20mm by 80mm by 200 mm length.

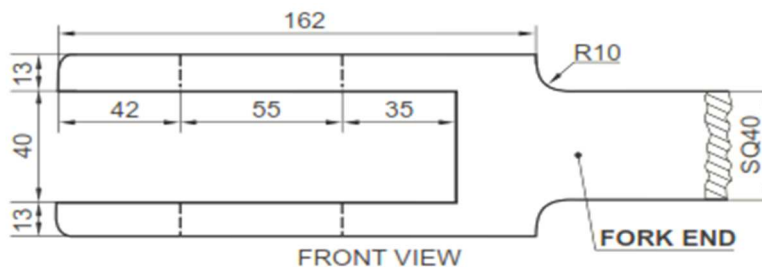


Figure 1 ; fork end

- Outline the five hand tools required (2 marks)
- Specify the four safety precaution to be adhered to when using the above hand tools (2 marks)
- Explain the procedure required to fabricated this component (10 marks)

iv. Explain how squariness and flatness is checked in the fabricated component

(4 marks)

- b) The plant layout of Jua Kali industry is as shown Figure 2 below. Of late management are incurring high insurances premier due to rampant fire outbreak. A Mechanical Engineer has been contracted to carry out an audit and give recommendation of the types of fires extinguishers required and how to locate them in the plant

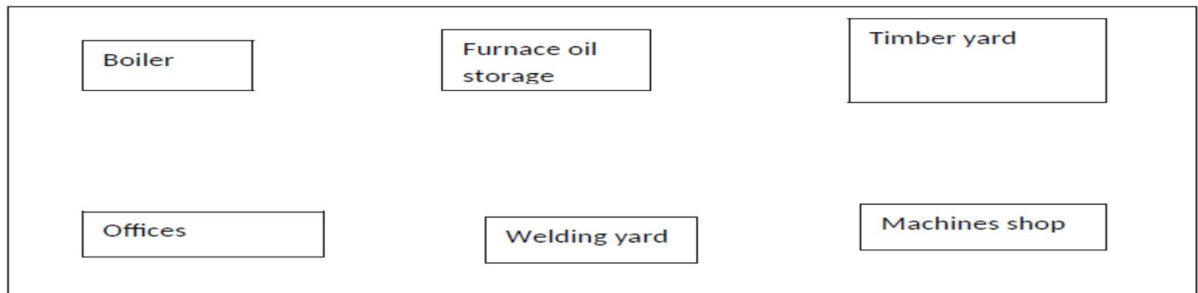


Figure 2 :Plant Layout of Jua Kali Industry

From you assessment,

- Describe types of extinguishers should be purchased at specific areas of the plant
 - What advice should be given to employees when fighting fire
- (10 marks)

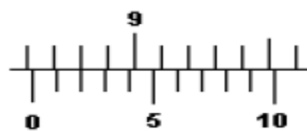
SECTION B

QUESTION TWO (20 MARKS)

- a) A Production Engineer in charge of workshop produces gear to clients in other industries. Of late the customer complains regarding operators not producing as the customer specification. What advice should you give on how the Engineer can reduce customer complains.

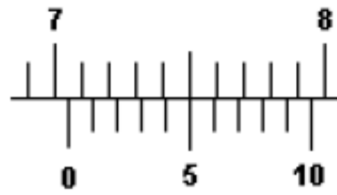
- b) Using sketch show the following reading

i.



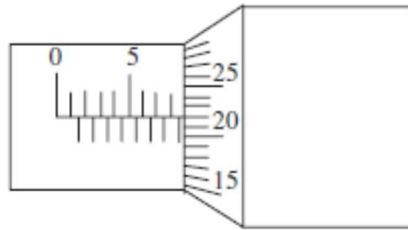
(2 marks)

ii.



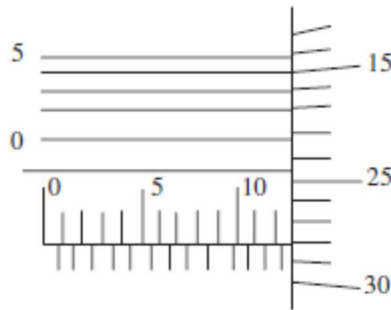
(2 marks)

iii.



(2 marks)

iv.



(2 marks)

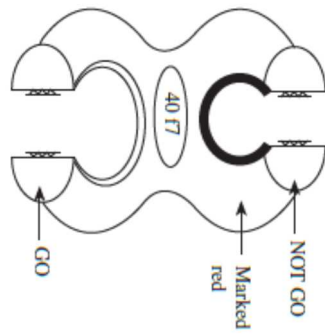
- c) A clearance fit has to be provided for a shaft and bearing assembly having a diameter of 40 mm. Tolerances on hole and shaft are 0.00 and 0.004 mm respectively. The tolerances are disposed unilaterally. If an allowance of 0.002mm is provided, find the limits of size for hole when

- Hole basis system (6 marks)
- Shaft basis system is used (6 marks)

QUESTION THREE (20 MARKS)

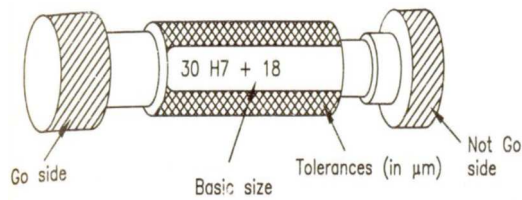
- a) A Mechanical Engineer trainee was given the following item to identify and describe its applications. The items that were given are as follows;

i.



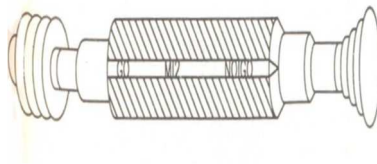
(4 marks)

ii



(4 marks)

iii



(4 marks)

- b) A Mechanical engineering student in Machakos University was given a project in joining components together as shown below in figure 3, After completing the job, he realized the joint was weak .

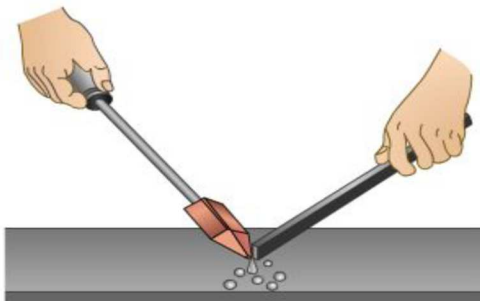


Figure 3: Joining process

As a Mechanical engineer, explained soldering techniques he missed in the process (8 marks)

QUESTION FOUR (20 MARKS)

a) Table 2 show the slip gauges available.

Table 2: Set of Slip Gauges

Range (mm)	Steps (mm)	No. of pieces
1.001 to 1.009	0.001	9
1.01 to 1.49	0.01	49
0.5 to 9.5	0.5	19
10 to 90	10	9
1.0005	-	1
	Total	87

Build the following

- i. 49.3825mm (3 marks)
- ii. 87.3215 mm (3 marks)
- iii. 35.4875mm (3 marks)
- iv. It is requires to build a 0.95mm height for some calibration purpose. This dimension is less than the least gauge in the above sets. How can you meet the requirements (4 marks)

b) The design Engineer drew the component as shown in figure 4 .

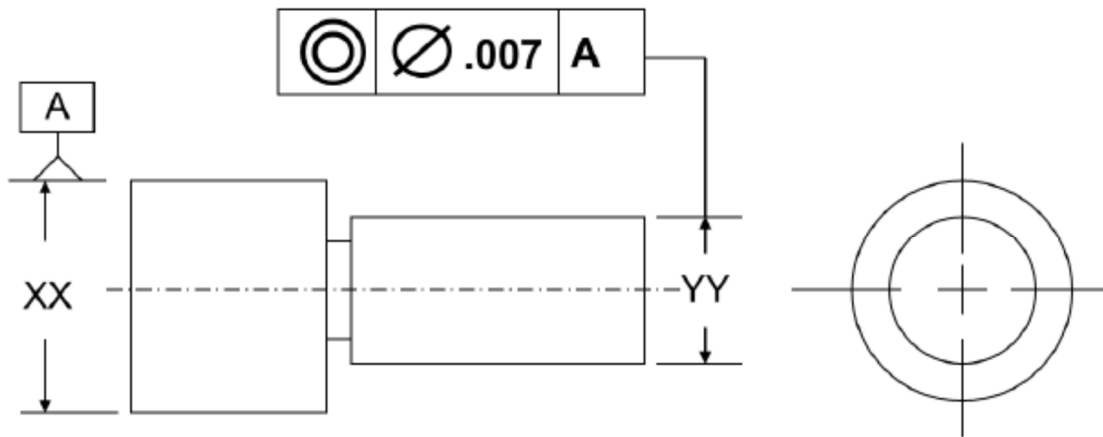


Figure 4 Shaft dimension

The in- charge of production department is suppose to interpret the drawing to the operator in lathe machine. From you own view, interpret the drawing. (10 marks)

QUESTION FIVE (20 MARKS)

- a) Two steel plates 12.5 mm thick are required to carry a tensile load of 500 kN in a double cover butt joint. Calculate the width of the plate if it is not to be weakened by more than one rivet hole. Design the butt joint completely and show dimensions on a sketch. The ultimate values of strengths are as follow

Plates in tension – 600 MPa

Rivet in Shear – 490 MPa

Plate and rivet in crushing – 920 MPa

Use a factor of safety of 4.5.

Also use following standards :

Rivet Holes

From 13.5 mm to 25.5 mm in steps of 2 mm and from 27 mm to 42 mm in steps of 3 mm.

Rivets

1.5 mm less than rivet hole diameter upto 24 mm in steps of 2 mm and
2 mm less than rivet hole diameter from 25 mm to 39 mm in steps of 3 mm.

(10 marks)

- b) Determine the tolerances on the hole and the shaft for a precision running fit designated by 50H7g6 given; 50 mm lies between 30-50 mm,

$$i = 0.45(D)^{1/3} + 0.001D$$

Fundamental deviations for H hole = 0

Fundamental deviation for g shaft = $-0.25D^{0.34}$

IT7=16i and IT6=10i

State the actual maximum and minimum sizes of the hole and shaft and maximum and minimum clearances

(10 marks)