



# MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST YEAR THIRD SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL & ELECTRONICS ENGINEERING

2601/104/MWT: MATERIALS, PROCESSES & WORKSHOP PRACTICE

DATE: 16/12/2020

TIME: 8.30-11.30 AM

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## INSTRUCTIONS TO CANDIDATES

*Answer All the questions*

*All questions carry equal marks*

1. a) Define the following terms as used in workshop technology;
  - i. Workshop (1 mark)
  - ii. Gangway (1 mark)
  - iii. Workshop layout (1 mark)
- b) i Using sketches, explain FOUR types of workshop layouts (4 marks)  
ii State any three factors to consider for a good workshop layout (3 marks)
- c) Assume that you are the owner of a heavy engineering firm. What are your responsibilities as an employer of the firm according to the Occupational Health and Safety Act? (3 marks)
- d) What do you understand by the term electric shock? (1 mark)
- e) As an electrician, how will you ensure you avoid electric shock in practice? (2 marks)
- f) You are working with Mr. Ayuko and suddenly he is shocked with heavy electrical current and suddenly his heart stops beating. Explain how you can use Mouth-to-

mouth resuscitation method to administer first aid (4 marks)

2. a) Describe the following properties of materials
- i. Ductility (2 marks)
  - ii. Conductivity (2 marks)
  - iii. Elasticity (2 marks)
- b) What is the difference between ferrous and non-ferrous metals? (2 marks)
- c) A mild steel structure is used to support a load of 250kN as shown in figure 3 below.

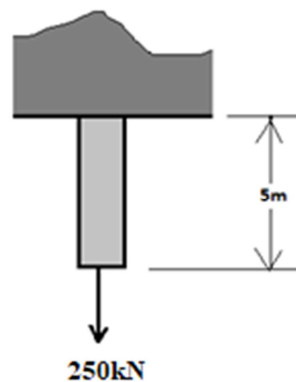


Figure 3

- i. If the maximum allowable stress of steel is 850 MPa, what is the minimum diameter of the structure required to just support the load? (4 marks)
  - ii. If the Young's Modulus of mild still is 200 GPa, determine the maximum extension of the structure. (2 marks)
- d) Describe the following electrical materials giving one example and one application of each
- i. Conductor (2 marks)
  - ii. Semi-conductor (2 marks)
- e) A material of length 20 mm is stretched to a length of 25 mm when a tensile force F is applied axially. Determine whether this material is ductile or brittle. (2 marks)

3. a) What do you understand by the terms: (2 marks)
- i. Tolerance
  - ii. Fits
- b) i Sketch and name the main parts of a micrometre screw gauge (2 marks)
- ii Using line diagram, sketch 5.33 mm reading on a micrometre screw gauge. (2 marks)
- c) Describe the following tools using sketches;
- i. Scribing block
  - ii. Odd leg calliper (4 marks)
- d) Why and how should the end of sheet metal products be treated? (3 marks)
- e) What do you understand by the following decorative processes? (2 marks)
- i. Lacquering
  - ii. Enamelling
- f) i State any three processes used to produce cables (3 marks)
- ii What is the difference between insulation and sheathing as applied in electrical cable construction? (2 marks)
4. a) Why are metal joining processes required? (1 mark)
- b) Study the tools in Figure 4.

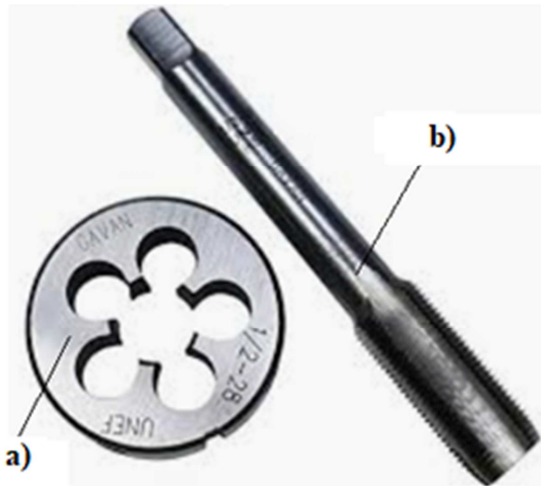


Figure 4

- i. Name tools a) and b) (2 marks)
- ii. State the type of mechanical joint that requires the above tools. (1 mark)
- iii. State one advantage of the joint identified in part b) above (1 mark)
- c) Welding is a common metal joining process used in the workshop.
  - i. Using sketches, describe any TWO types of welded joints. (2 marks)
  - ii. State any FOUR disadvantages of welding as metal joining processes? (4 marks)
  - iii. What are welding defects? State any THREE welding defects (4 marks)
  - iv. What are the two functions of flux in welding? (2 marks)
- d) i Explain the effect of temperature on the strength of a soldered joint. (1 mark)
- ii State TWO types of soldering (2 marks)
5. a) State any THREE workshop hand tools (3 marks)
- b) What precautions do you need to observe when using a lathe machine? (3 marks)
- c) i Name the lathe work-holding devices shown in Figure 1. (4 marks)

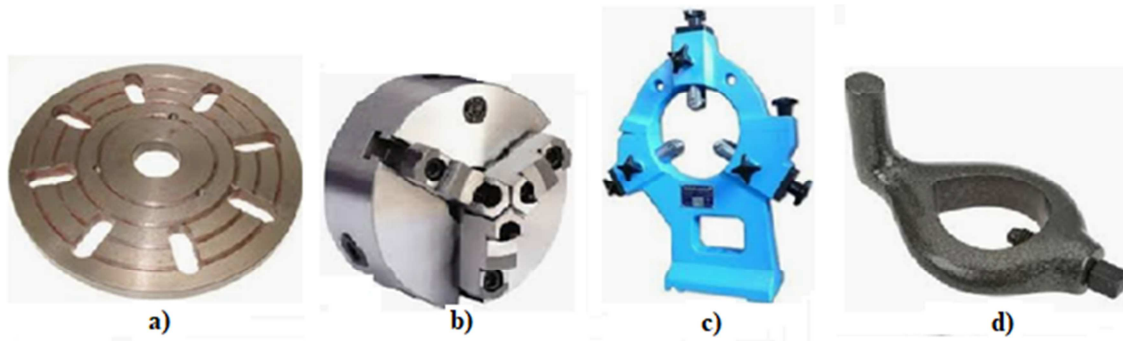


Figure 1

- ii Describe any THREE operations that can be performed on a lathe machine. (3 marks)

d) Study the machine shown in Figure 2 below;

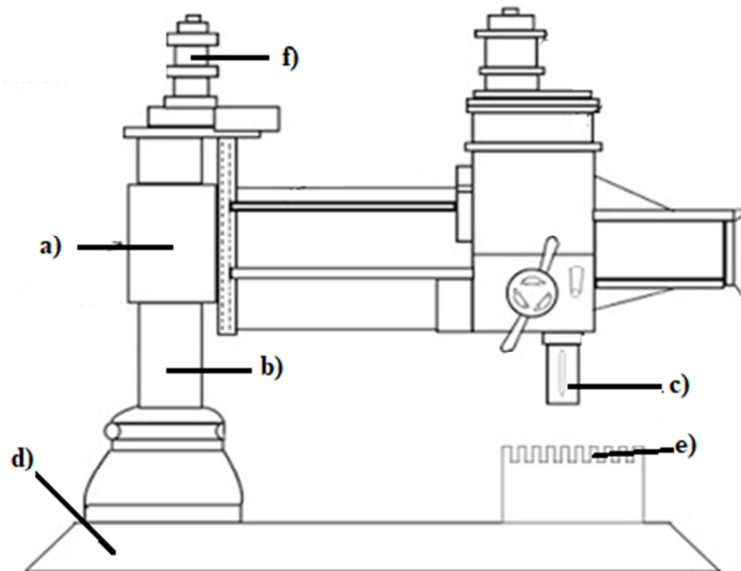


Figure 2

- i. What is the name of the machine? (1 mark)
- ii. Name the parts labelled a) to f). (3 marks)
- iii. What is the function of the part labelled f)? (1 mark)
- e) List any TWO machines used in the workshop to fabricate sheet metal products like meter box. (2 marks)