



**UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER**

PROGRAMME: BSC ABE II

COURSE CODE: ABE204 / ABE 207

TITLE OF PAPER: WORKSHOP TECHNOLOGY

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

**INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO
OTHER QUESTIONS.**

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SECTION I COMPULSORY

QUESTION 1

a) Name two examples of natural and artificial non-metals respectively [4 marks]

| | Examples of natural non-metals | Examples of artificial non-metals |
|---|--------------------------------|-----------------------------------|
| 1 | | |
| 2 | | |

b) Name three different types of carbon steels. Give two common practical applications of each type of carbon steel [9 marks]

| | Carbon steel | Two examples of common use |
|---|--------------|----------------------------|
| 1 | | |
| 2 | | |
| 3 | | |

c) Heat treatment of metals has different effects on steel. Distinguish between annealing and Normalising using the characteristics in the Table below. [4 marks]

| | Characteristic | Annealing | Normalising |
|---|-------------------------------|-----------|-------------|
| 1 | Process | | |
| 2 | Effect on properties of steel | | |

d) Distinguish between stress and strain [2 marks]

e) State Hooks Law [3 marks]

- f) Figure 1 shows the stress-strain curves of four metals A, B, C and D. state the property exhibited by the metals. [8 marks]

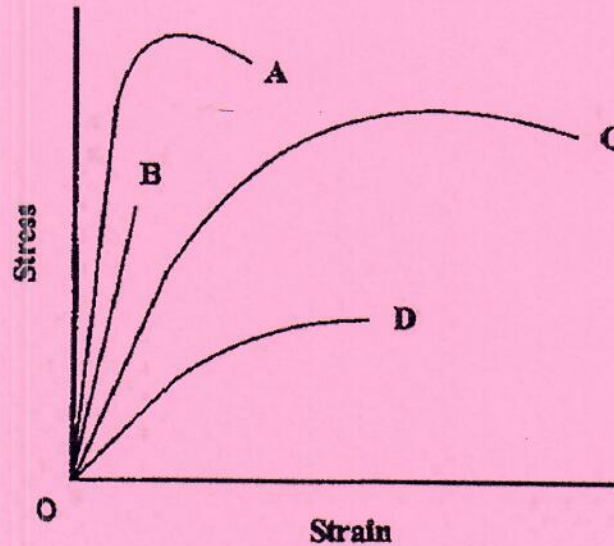


Figure 1 A graph showing stress-strain behaviour of four metals

| Metal | Property exhibited | Reason for choice of property |
|-------|--------------------|-------------------------------|
| A | | |
| B | | |
| C | | |
| D | | |

- g) A farmer has 400 kg carcass of a cow and wants to hang it in a cold room. Different hooks of R10 steel rods are available for hanging the carcass. Determine the length of the hook the farmer can use to hang if Young's Modulus of Elasticity for the steel is 200 MPa, and the hook may only extend by 2 mm. Assume a gravitational acceleration of 10 m/s^2 [10 marks]

SECTION II ANSWER ANY TWO QUESTIONS

QUESTION 2

- a) Figure 2 shows the parts of a portable grinder. Name the different parts of the grinder. [10 marks]

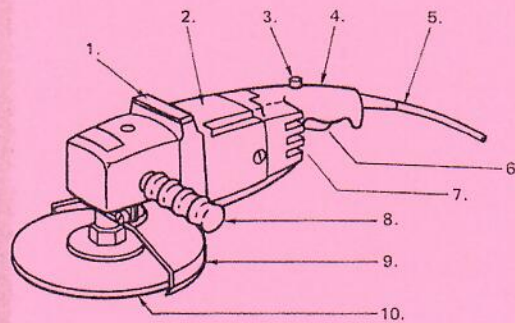


Figure 2 a portable grinder.

- b) Figure 3 shows the cutting angles on a hacksaw blade. Name the angles marked on the blade teeth. [6 marks]

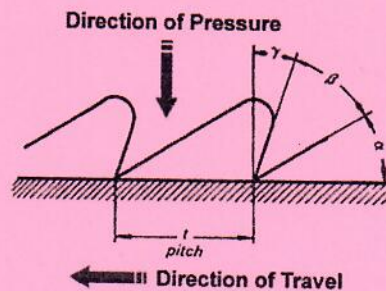


Figure 3 important angles of a cold chisel

- c) The metal cutting wedge is fundamental to the geometry of
 - i) Hand cutting tools only.
 - ii) Power driven tools only.
 - iii) Sheet metal cutting tools only.
 - iv) All cutting tools. [2 marks]
- d) Continuous chips are formed when cutting
 - i) Ductile materials;
 - ii) Brittle materials;
 - iii) Amorphous plastic materials;
 - iv) Free-cutting non-ferrous materials. [2 marks]

- e) The rake angle of a cutting tool prevents
 - i) Prevents rubbing;
 - ii) Controls the chip formation;
 - iii) Determines the profile of the tool;
 - iv) Determines whether the cutting action is oblique or orthogonal.[2 marks]
- f) Files are used to work metals into required forms/shapes.
 - i) Sketch the plan view of a flat file and indicate its main features and length [4 marks]
 - ii) By means of sketches show the difference between single cut and double cut files. [4 marks]

QUESTION 3

- a) A cellulose lacquer is painted on a surface prior to marking out in order to:
 - i. Prevent corrosion;
 - ii. Provide a means of identification;
 - iii. Provide a contrasting background;
 - iv. Protect the scriber point. [2 marks]
- b) Hermaphrodite (odd-legged) callipers are used to scribe
 - i. Circular lines;
 - ii. Lines parallel to an edge;
 - iii. Lines perpendicular to an edge;
 - iv. Irregular profiles. [2 marks]
- c) Scribing instruments should be kept sharp with the aid of:
 - i. A grinding wheel (stone);
 - ii. A smooth file;
 - iii. Metal polish;
 - iv. An oil stone. [2 marks]
- d) A fixed point, line, edge or surface from which a measurement can be made is known as a:
 - i. A coordinate;
 - ii. Centre;
 - iii. Datum;
 - iv. Dimension line. [2 marks]
- e) The hole in Figure 4 has been dimensioned using:
 - i. Polar coordinates'
 - ii. Rectangular coordinates;
 - iii. Centreline line datum;
 - iv. An edge datum. [2 marks]

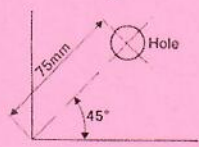


Figure 4 drawing of marked metal sheet.

f) Figure 5 shows blades of a hacksaw.

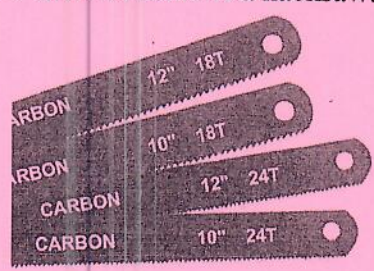


Figure 5 Key information on hacksaw blades

- i. What information is inscribed on the blade? [3 marks]
- ii. Select the blade you would use for cutting a 5 mm thick steel [2 marks]
- iii. Show the calculation that you used to determine the blade [5 marks]

g) Before embarking on making any project, it is advisable to prepare a bill of quantities.

- i. What is a bill of quantities? [2 marks]
- ii. What information should be included for each component in a bill of quantities? [8 marks]

QUESTION 4

a) Distinguish between permanent and temporary joints. [6 marks]

b) Classify the type of joints produced by the following process

- i) Gluing; [2 marks]
- ii) Riveting; [2 marks]
- iii) Brazing; [2 marks]
- iv) Soldering; [2 marks]
- v) Bolt and nut fastening; [2 marks]

c) Cutting tools normally require sharpening to maintain the effectiveness of the cutting edge. However, grinding wheels have self-sharpening characteristic such that no operator initiated sharpening is necessary.

Explain the action of self-sharpening of grinding wheels [10 marks]

d) Discuss finishing as an activity in the production process of a project. [4 marks]