ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

DESIGN AND TECHNOLOGY 6005/1

PAPER 1 Design and Technology Theory

SPECIMEN PAPER 3 hours

Additional materials: **A2** Drawing papers (4 sheets),
Standard Drawing Equipment,
Separate answer sheets.

TIME **3 hours**

INSTRUCTIONS TO CANDIDATES

Print your name, centre number and candidate number on every sheet of paper you use.

Answer **all** questions in **Section A** and **one** question in **Section B** and **Section C** is compulsory.
Work out **all** your answers in **SI** units. Use both sides of the drawing paper.

All solutions are to be drawn **full size** unless a contrary instruction is given. Construction lines must be shown clearly.
Measurements **not** given are left to your discretion.
If you use more than one sheet of paper, fasten the sheets together.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.
The diagrams are **not** necessarily drawn to scale.
All dimensions are in **millimetres** unless otherwise stated.
You are reminded of the need for clear presentation in your answers.

This question paper consists of 8 printed pages.

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SECTION A

Answer all questions in this section. Each question carries **10** marks.
You are advised to spend **45** minutes in this section.

1. A local company is producing industrial chemical waste from its paint manufacturing plant and draining it into a nearby stream.

(a) Describe any environmentally friendly way of disposing:

(i) solvents, [2]

(ii) paint soaked rugs and towels. [2]

(b) Describe dangers associated with draining waste into streams to:

(i) humans, [2]

(ii) the environment. [2]

(c) Propose a method of ensuring that the company stops drawing waste into the stream. [10]

2 The roof truss is a common but efficient way of transmitting loads in buildings. Trusses can be made from any suitable material.

(a) Make a sketch of a roof truss for a span of 10 metres and label any three parts. [4]

(b) Explain how the members of the structure transmit forces in relation to the parts. [4]

(c) Name the material used in making the roof truss and give a reason for choosing this material. [2]

3 Transmission of motion can be made using gears, belts and pulleys or chain and sprockets.

(a) **(i)** Give one example of the application for each of the transmission methods. [3]

(ii) State three advantages of chains over belt drivers. [3]

(b) Name the material used in the manufacture of: **(i)** belts,

(ii) pulleys,

(iii) chains,

(iv) sprockets. [4]

4 Describe, stage by stage, the necessary steps to be followed in the correct patenting procedures for intellectual property rights. [10]

SECTION B

You are advised to spend 45 minutes in this section.

Answer **only one** question from this section on the answer sheets provided.

Each question carried 20 marks.

5 **(a)** A cubic metre of mukwa costs $4,000 at the sawmill.

Calculate the cost of the piece shown in **Figure 1**. The piece is from the same material quoted above. [6]

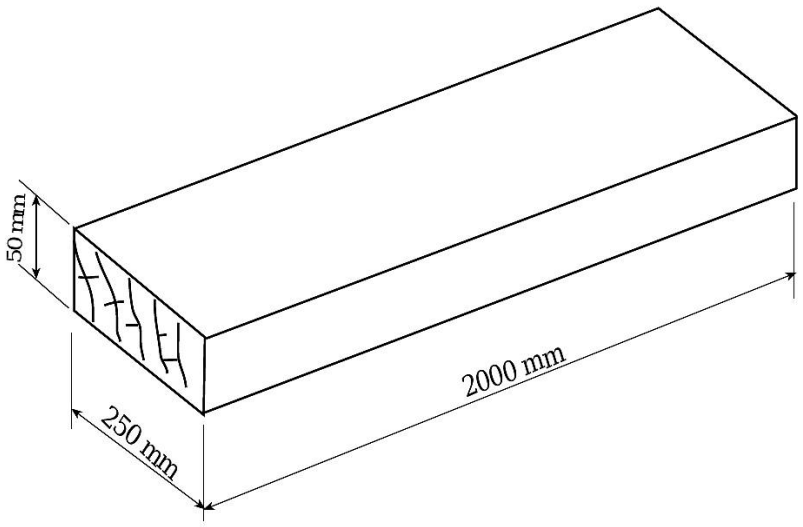


Figure 1

(b) **(i)** Describe physical characteristics of hardwood. [3]

(ii) Describe and explain the reasons for natural and kiln seasoning. [6]

(iii) What is meant by the term warping? [2]

(iv) Describe the use of veneer. [1]

(v) Describe the general nature and give one typical application for softwood. [2]

[10]

6 **Figure 2** shows orthographic views of a toolmaker's clamp.

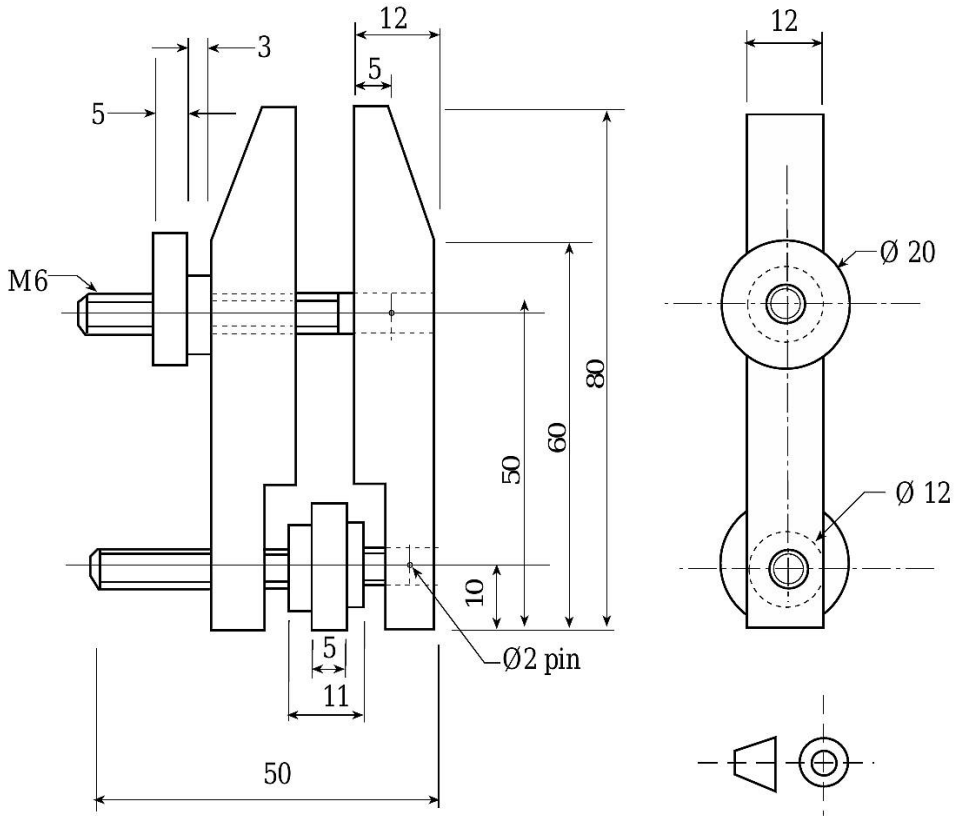


Fig. 2

Draw, to a scale of **2:1**, an isometric drawing of the toolmaker's clamp. [20]

7 The diagram in **Figure 3** shows two shafts **A** and **B**. Shaft A is expected to turn shaft **B**.

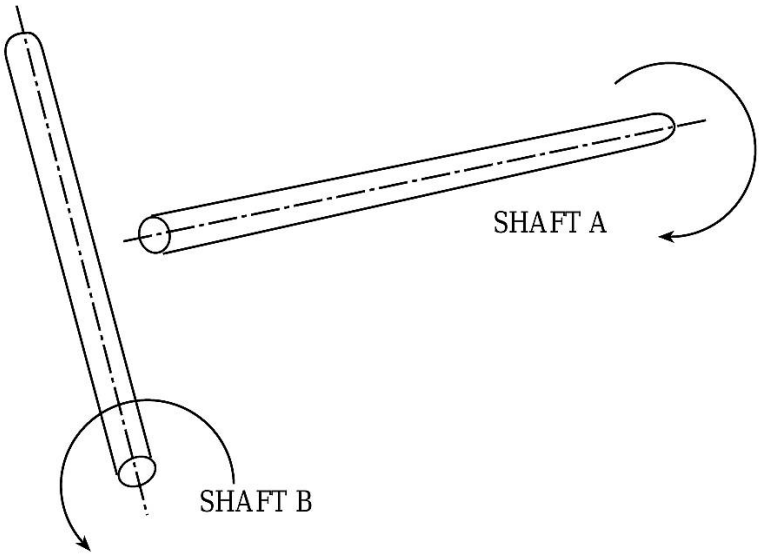


Figure 3

(a) Suggest a suitable type of gears that can be used to transmit motion from shaft **A** to shaft **B**. [1]

(b) Identify any other three methods that can be used to transmit motion. [3]

(c) For the three methods identified in **(b),** give an example of a situation where it can be applied. [3]

(d) If shaft **A** is rotating at a speed of **100 r.p.m.** and shaft **B** is required to rotate at **200 r.p.m**. Calculate the: **(i)** gear ratio [7]

(ii) number of teeth [6]

SECTION C

This question is **compulsory**.

You are advised to spend 1 hour 30 minutes in this section.

Answer the question on the **A2** drawing paper provided.

8 You should approach the design question in the following manner:

Analysis:
Produce an analysis of the given situation/problem, which may be in written or graphic form.

Specification:
From the analysis produce a detailed written specification of the design requirements. Include at least three specification points other than those given in the question.

Development:
Show using bold sketches and notes, the development, reasoning and composition of ideas into a single design proposal. Give details of materials, constructional and other relevant technical skills.

Proposed Solution:
Produce drawings of an appropriate kind to show the complete solution.

Evaluation:
Give a written evaluation of the final design solution.

Many students use bicycles to go to school but at times their bicycles are not safe since there is nowhere to lock them on arrival at school.

Design a locking rack to accommodate two bicycles. The rack should include at least two mechanisms and application of electronics.

(a) List any three points that you consider important about the functions of your device. [3]

(b) Using notes and sketches generate sketches of two possible solutions of locking the bicycles to the rack [10]

(c) Using notes and sketches develop the chosen solution and state the reasons for each material chosen. [5]

(d) Produce a sectional front and end elevation in first or third angle projection which shows all of the features that you have designed. [22]

[40]