ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

METAL TECHNOLOGY AND DESIGN 6040/1

PAPER 1 THEORY DRAWING AND DESIGN

SPECIMEN PAPER 3 hours

Additional materials:
Answer paper, A2 drawing paper,
Standard drawing equipment, Scientific calculator.

TIME: 3 hours

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces provided on the answer paper/answer booklet.

Answer **all** questions in Section **A** on separate answer paper provided.

For numerical answers, all working should be shown.

Answer questions **5** and **6** on **A2** drawing papers provided.

INFORMATION FOR CANDIDATES

Marks are given in brackets [ ] at the end of each question or part question.

Dimensions not shown are left to your discretion.

This question paper consists of 5 printed pages and 3 blank pages.

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Section A

*Answer **all** questions.*

1 **(a)** Define the following terms in relation to material properties:

(i) elasticity,

(ii) plasticity,

(iii) ductility,

(iv) tensile strength.

(b) **Fig. 1** below shows a tool used in a workshop.

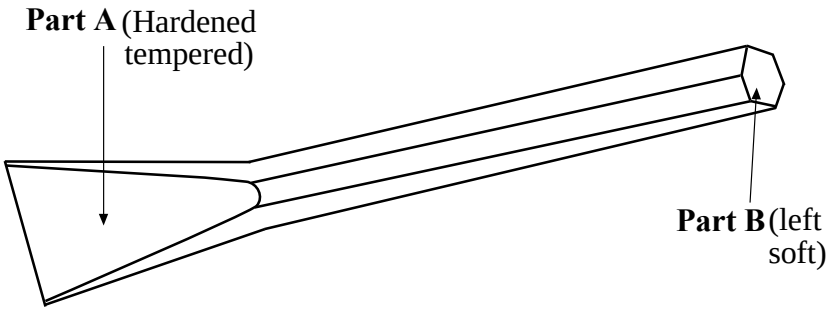

Fig. 1

(i) Suggest the material that can be used to make the tool. [1]

(ii) Give a reason for your suggestion. [1]

(iii) Give a reason why part B of the tool is not hardened and tempered. [1]

2 **(a)** Give **one** reason why doping is done in electronics. [1]

(b) Name any **two** elements which form interstitial solid solution. [2]

(c) With the aid of a diagram explain the structure of an interstitial solid solution. [4]

3 **(a)** Sketch a graph to show the relationship between stress and strain and indicate the yielding point. [3]

(b) Consider a tie bar of **300 cm** long, **8 cm** wide and **16 cm** high as shown in **Fig. 2**. It is subjected to a pulling force of **4 000 kN**. As a result a Change in length of material is **2,5 cm**.

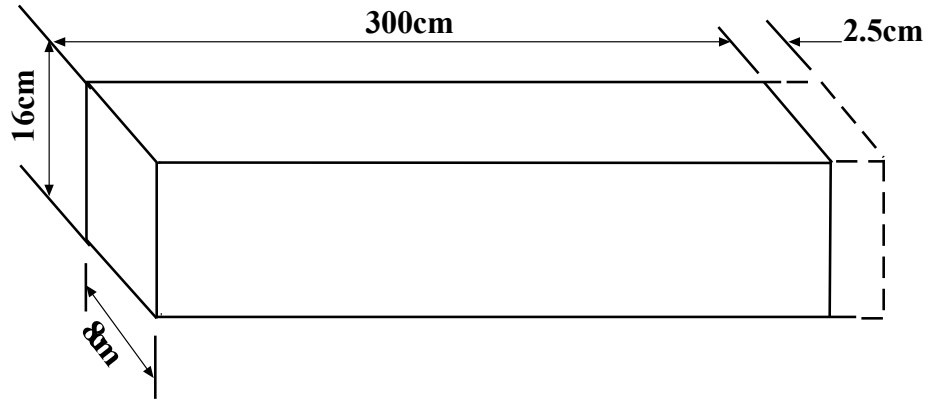

Fig. 2

Calculate the Young modulus of elasticity of the material. [4]

4 **(a)** Identify **one** type of manufacturing system that can be used in the production of goods in the metal industry. [1]

(b) Explain the purpose of the manufacturing system stated in 4(a) above. [1]

(c) Give **one** advantage and **one** disadvantage of the manufacturing system discussed in **4(a)** above. [2]

(d) State any **three** factors that may be considered when adding value to a manufactured product of your choice. [3]

Section B

*Answer question 5 on the **A2** drawing paper provided.*

*You are advised to spend not more than **1 hour 20 minutes** on this section.*

5 A Farm School has introduced Metal Technology and Design at 'A' level. The school has critical shortage of tools to use during practical lessons in the workshop.

As a Metal Technology and Design learner you are required to design a suitable combination tool/device that can be used for holding cylindrical work and marking out lines parallel to an edge.

(a) State any **two** additional specifications. [2]

(b) Generate **two** possible solutions. [10]

(c) Analyse the **two** possible solutions. [8]

(d) Choose **one** solution and justify your choice. [8]

(e) Produce sketches of working drawings of the chosen solution. [8]

(f) Propose **two** specific materials that can be used to make the solution and justify your choice. [4]

(g) Select any **one** part of the solution and explain how it can be produced in a workshop. [5]

[40]

Section C (32 marks)

*Answer question **6** on the **A2** drawing paper provided.*

You are advised to spend not more than 1 hour on this section.

6 The best pulley unit shown in **Fig. 3** consists of a mounting bracket **(1)**, a belt pulley **(2)**, a fitted bolt **(3)** and two bushes **(4)**.

Draw twice **full size**, in first angle projection with all parts assembled.

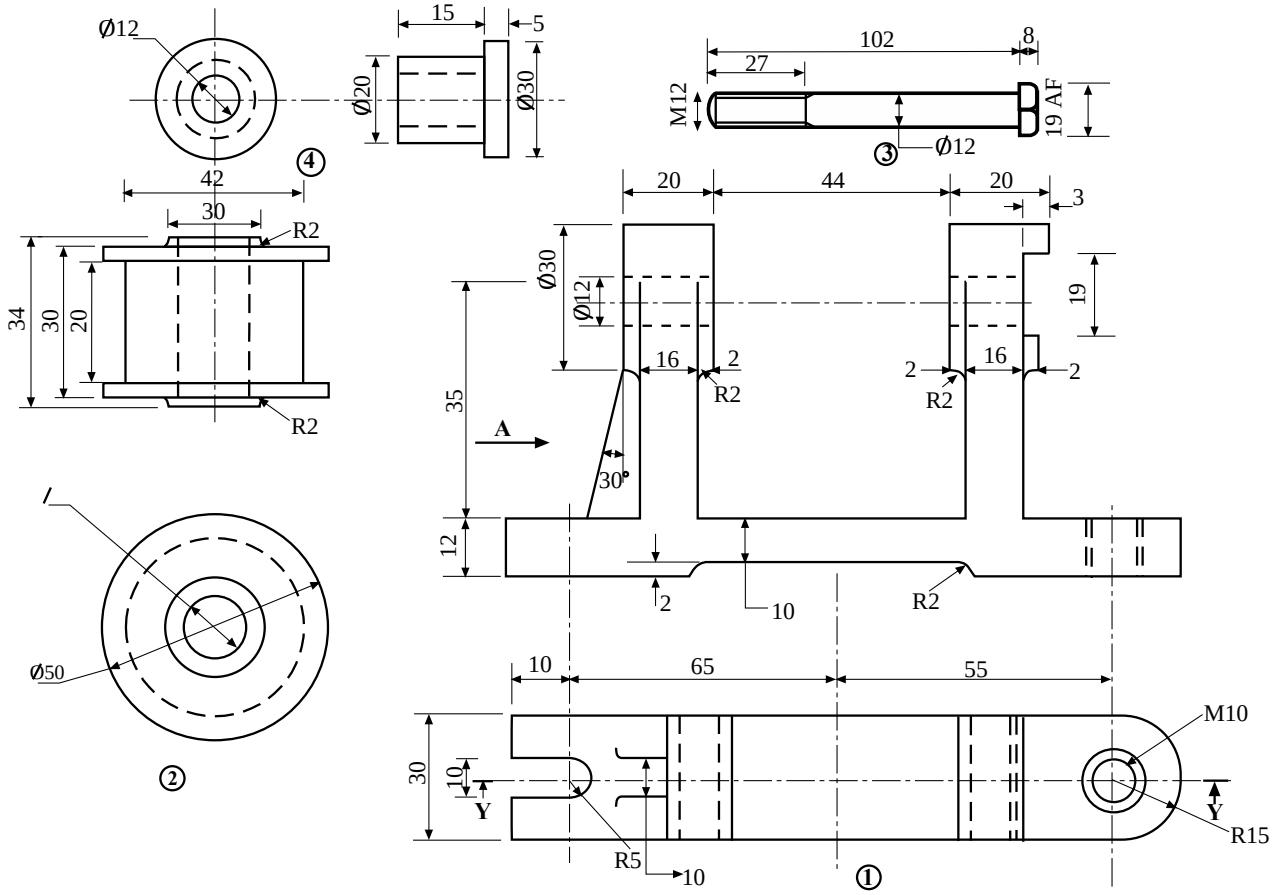

Fig. 3

(a) A sectional front view on **YY**. [20]

(b) End view in the direction of arrow **A**. [12]

[32]

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