

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**METALWORK**

**6040/01**

Paper 1 Theory, Drawing and Design

October/November 2004

**2 hours 45 minutes**

Additional Materials: Answer Paper  
A2 Drawing Paper (1 sheet)  
Standard Drawing Equipment

**READ THESE INSTRUCTIONS FIRST**

Write your name, Centre number and candidate number in the spaces provided on the Answer Paper/Answer Booklet.

**Section A**

Answer any **three** questions.

Write your answers on the separate Answer Paper provided.

**Section B**

Answer **all** questions.

Use the A2 sheet of Drawing Paper prepared prior to the examination for your answers.

At the end of the examination, fasten together the separate Answer Paper for Section A and place it within your folded drawing paper for Section B.

The number of marks is given in brackets [ ] at the end of each question or part question.

All dimensions are in millimetres unless otherwise stated.

Except where pictorial views are used **all** diagrams are in First Angle Projection.

This document consists of **8** printed pages and **4** blank pages.



## Section A

## Theory

Answer any **three** questions in this section.

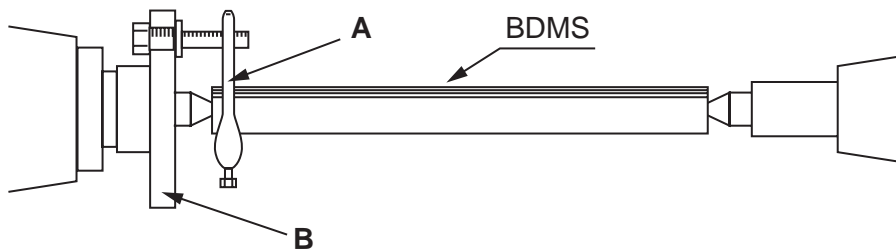
**Use bold sketches to illustrate your answers wherever possible.**

You are advised to spend 1 hour 15 minutes on Section A.

1 Consider a centre-lathe:

- (a) (i) State why a 3-jaw chuck is provided with a set of inside and outside jaws. [2]  
 (ii) Describe how to replace the inside jaws with the outside jaws. [5]
- (b) (i) Give **one** advantage of using a 3-jaw chuck over a 4-jaw chuck. [1]  
 (ii) Give **two** advantages of using a 4-jaw chuck over a 3-jaw chuck. [2]

Fig.1 shows a length of  $\text{Ø}25 \times 200$  long BDMS set up for turning between centres.



**Fig. 1**

- (c) (i) Name the parts labelled A and B. [2]  
 (ii) With the aid of sketches describe in detail how the ends of the BDMS bar are prepared so that they can be mounted between the headstock and tailstock centres. [5]
- 2 (a) (i) Name **two** permanent methods of joining metal together and show, using diagrams, one example of each. [5]  
 (ii) Describe in detail how **one** of the methods named in (a)(i) would be carried out. [4]
- (b) (i) Name **two** semi-permanent methods (temporary) of joining metal together and show, using diagrams, one example of each. [5]  
 (ii) Describe in detail how **one** of the methods named in (b)(i) would be carried out. [3]

- 3 Fig. 2 shows a sketch of a snake that is to be made from Ø15 section black mild steel.

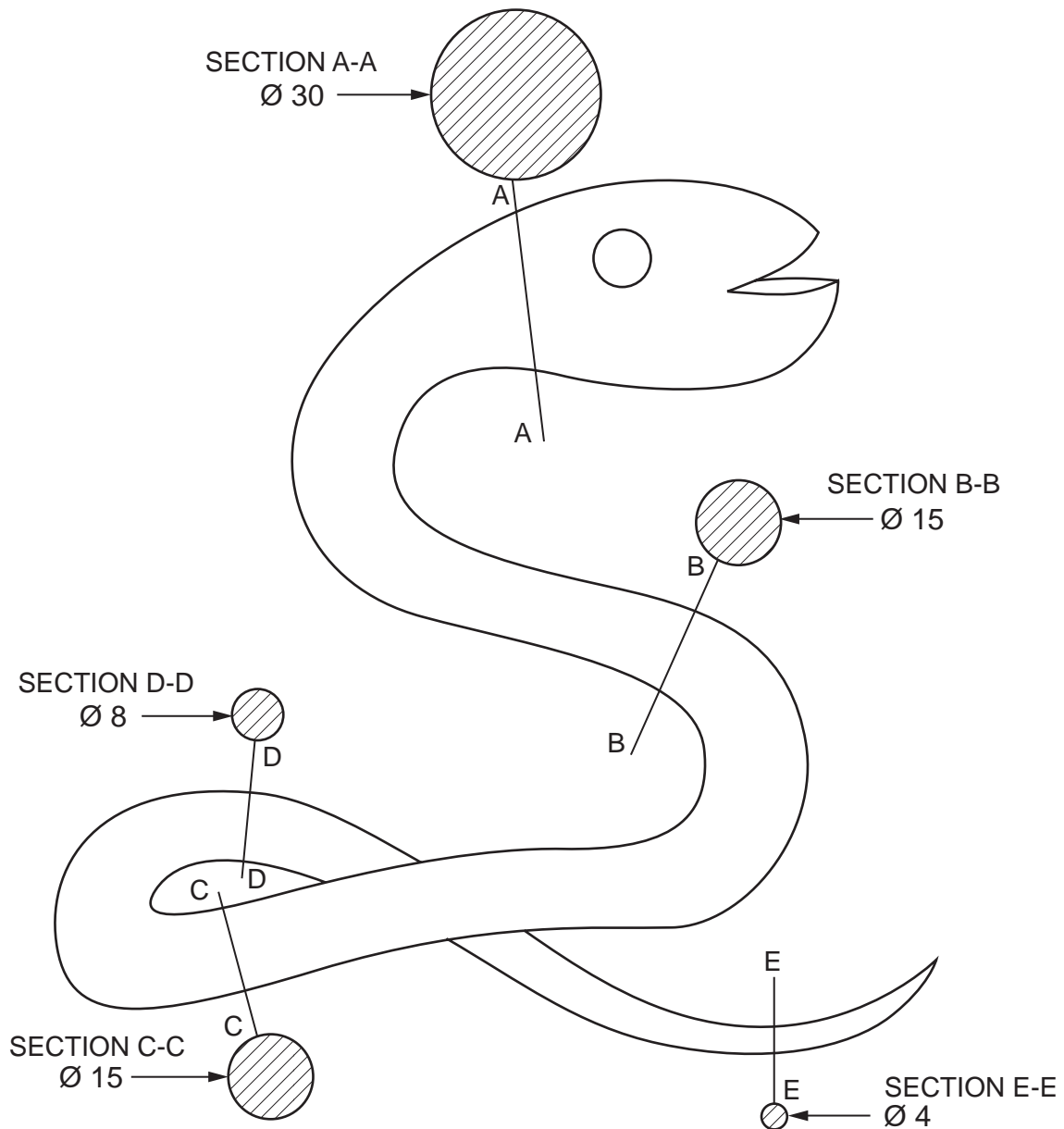


Fig. 2

(a) Explain in detail how you would:

- (i) upset the end in preparation for forging the head; [3]
- (ii) draw down the taper for the tail; [3]
- (iii) produce the curve on the tail; [3]
- (iv) form the mouth; [3]
- (v) produce the through hole that represents the eye of the snake using forge methods only. [3]

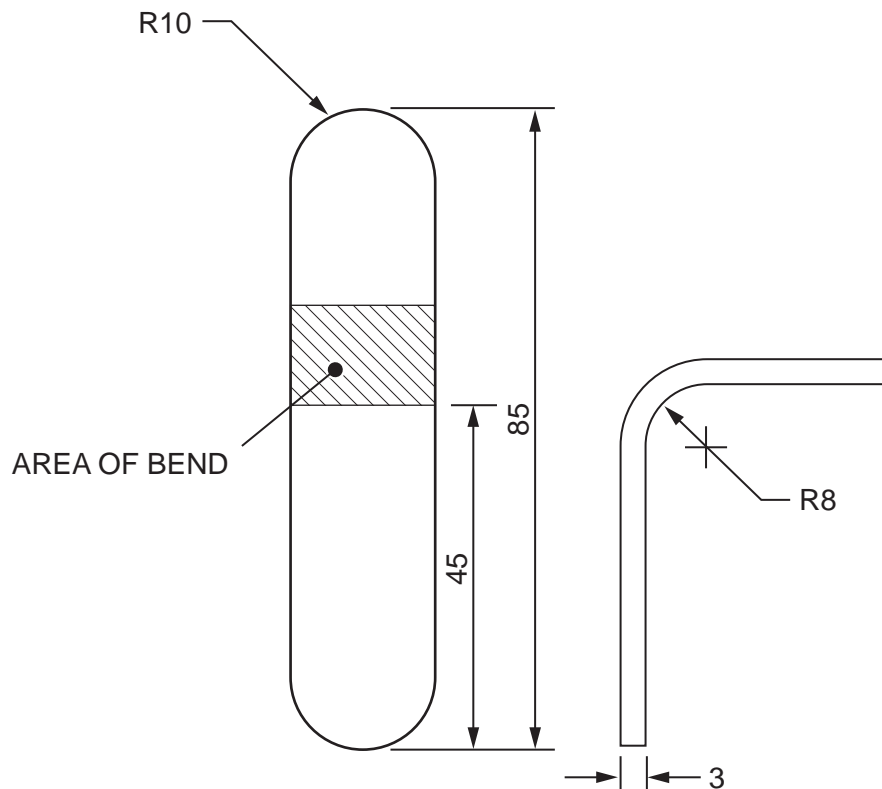
(b) Name **two** safety precautions that should be taken when forging the snake. [2]

- 4 (a) Describe briefly the main processes in the making of iron from iron ore. [5]
- (b) (i) What are the main differences between cast iron and cast steel (high carbon steel)? [4]
- (ii) Name an appropriate use for each of the above metals. [2]
- (c) In column A of the chart below, a number of products are shown. Column B gives an appropriate material for their manufacture. State why the materials specified are suitable for each product.

A	B
Boat fittings	Brass
Electric cable	Copper
Food cans	Tin-plate
Suspension cable	High tensile steel
Saucepan	Aluminium
Roof sheeting	Lead

[6]

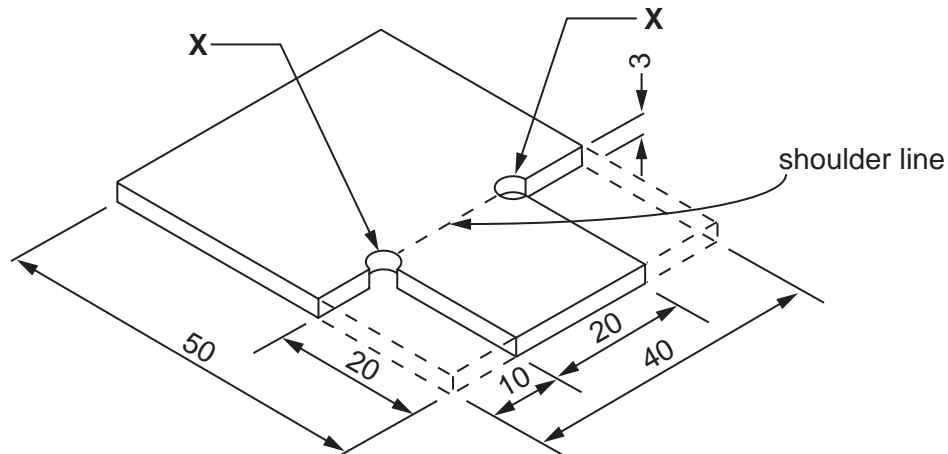
- 5 Fig. 3 shows a bracket made from BDMS.



**Fig. 3**

- (a) Describe in detail how the R8 bend may be produced. [6]
- (b) (i) State why a folding bar would be inappropriate to form the R8 in Fig. 3. [2]
- (ii) Show with a sketch an example of a piece of tinplate set up for bending at 90° in a folding bar. [3]

The component in Fig. 4 is to be bent at 90° along the shoulder line.



**Fig. 4**

- (c) (i) Describe, with the aid of a sketch, how the holes at **X** would be drilled before shaping and bending. [4]
- (ii) What are the advantages of the holes at **X**? [2]

## Section B Drawing and Design

Answer **all** questions in this section.

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

Use the sheet of A2 drawing paper prepared prior to the examination for your answers.

Set the paper with the long edge to the top of your drawing board and use the space to the right of the line on your paper to make your freehand sketch solutions in answer to Question 6.

### Use only one side of your paper

Use your own discretion where dimensions are not given.

Fig. 5 shows incomplete details of a comparative hardness tester made from BDMS with the tip of Part B case-hardened. Fig. 6 gives the sizes of Parts A and B. In use, Part B is dropped from Part A on to samples of metal. The resulting indentations are then measured to compare the hardness of the samples.

- 6** To the right of the line on your paper make a series of sketches leading to the solution of the design problems below. **Brief** notes should be added to identify details such as important sizes and specific materials. It should be possible for the examiner to understand your solutions from these sketches.

To solve these problems you may incorporate additional parts and make minor modifications to the given components. Methods of assembly should not include the use of adhesives.

### Design Problems

- (a)** A method of attaching Part A to Part D so that:
- (i)** the centres are 25mm apart;
  - (ii)** Part A can be adjusted and locked at any height on Part D;
  - (iii)** the centre of Part A is always aligned with the target location on Part C.
- (b)** A method of holding Part B in a raised position and then allowing it to be released to drop on to the sample.
- 7** Draw full size in 1st or 3rd angle projection the following views of the comparative hardness tester complete with your solutions to the design problems in Question 6.
- (a)** A front view in the direction of arrow **Y** with the tip of Part B set 50 mm above Part C.
  - (b)** A sectional end view in the direction of arrows **X – X**.

Mark allocation:  
 Communication [25]  
 Design [24]

**Figs. 5 and 6 can be found on pages 8 and 9 respectively.**

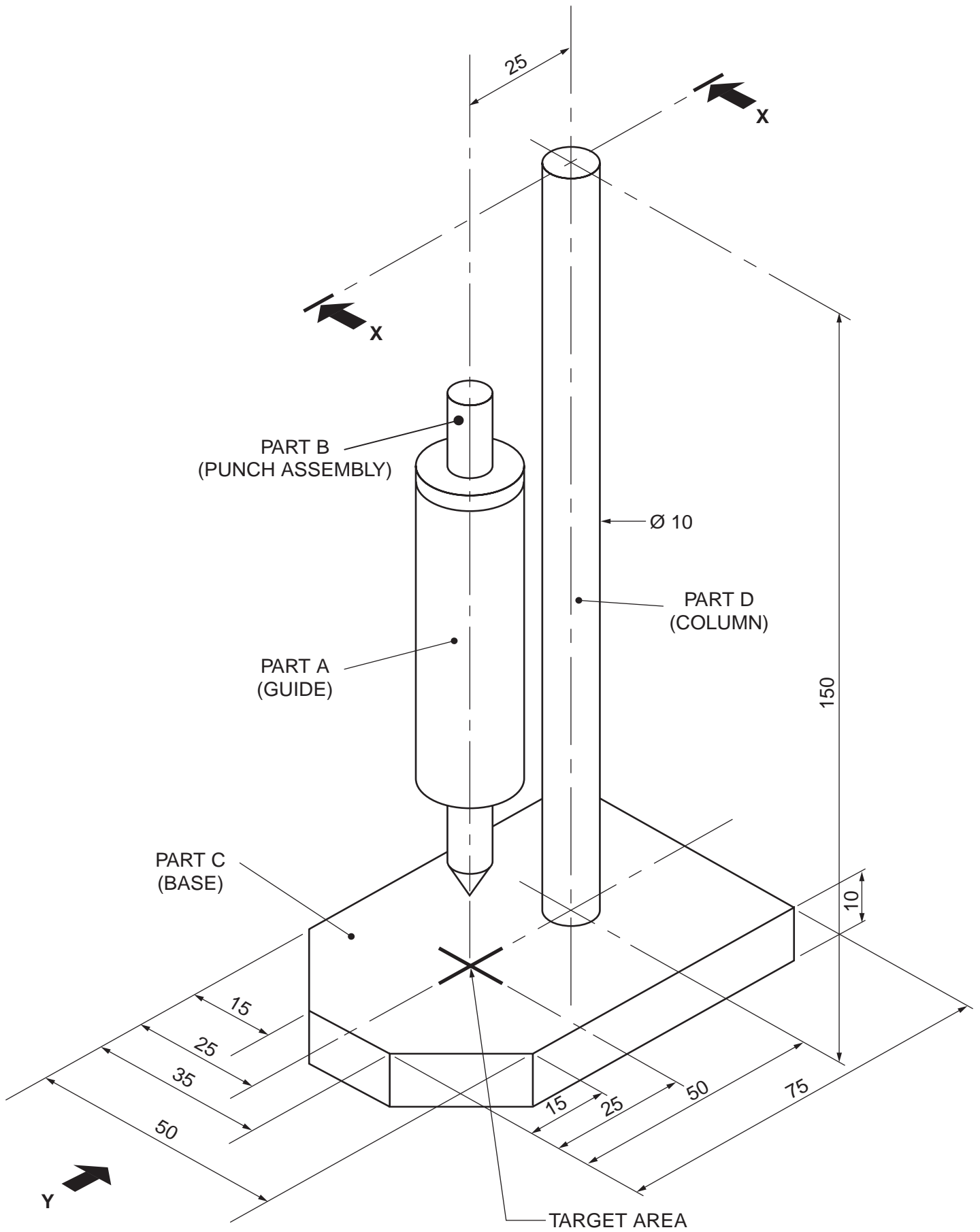
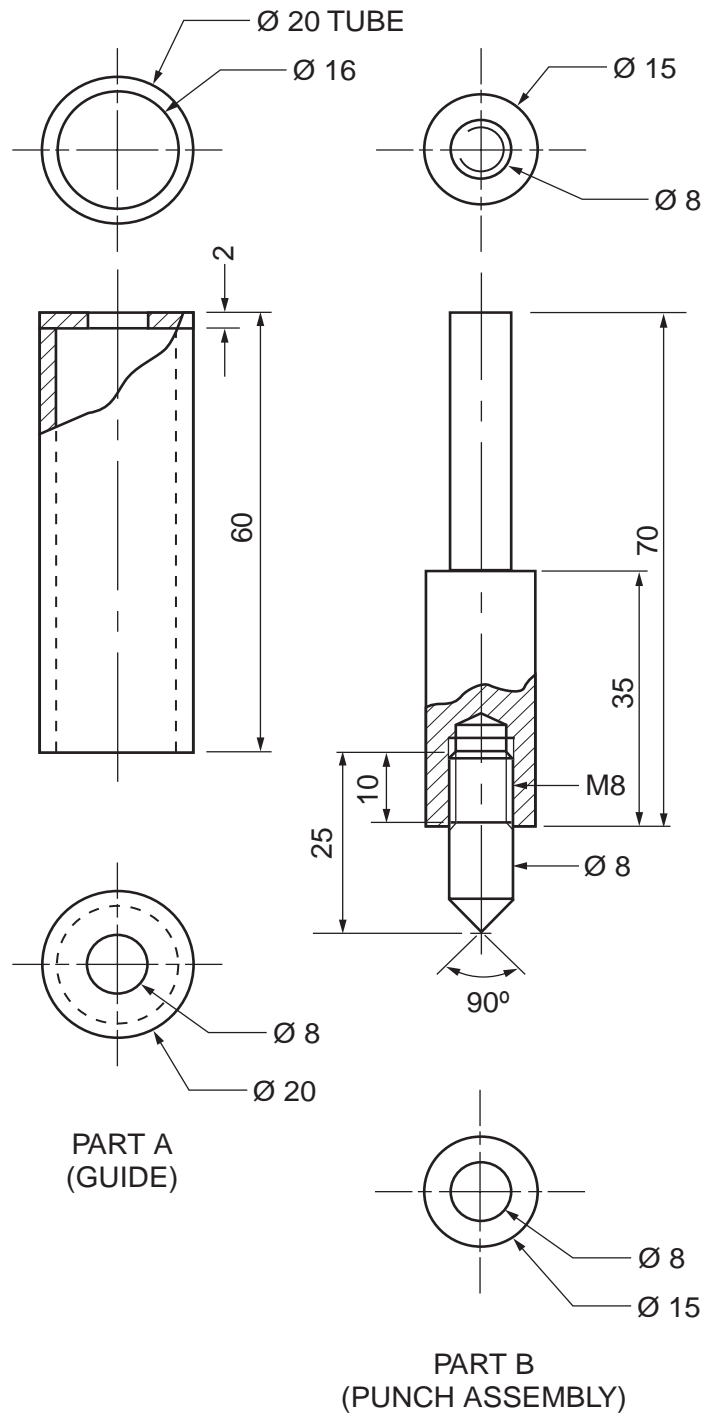


Fig. 5





**MATERIAL: ALL PARTS MADE FROM BDMS**

**Fig. 6**





