EXAMINATIONS COUNCIL OF ZAMBIA

Joint Examination for the School Certificate
and General Certificate of Education Ordinary Level

METAL WORK 6040/1

PAPER 1: Theory, Drawing and Design

Tuesday 28 OCTOBER 2014

Additional materials:
A4 Answer Booklet
A2 drawing paper (1 sheet)
Standard drawing equipment

2 hours 45 minutes Marks: 100

INSTRUCTIONS TO CANDIDATES

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

Section A

There are **five** questions in this section.

Answer **any three** questions.

Write your answers in the Answer Booklet provided.

Section B

There are **two** questions in this section.
Answer **both** questions.

Use the A2 sheet of drawing paper prepared prior to the examination for your answers.
At the end of the examination, fasten the Answer Booklet for **Section A** and place it within your folded drawing paper for **Section B** after tying loosely in the top left hand corner.

INFORMATION FOR CANDIDATES

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 Third Angle Projection.

SECTION A

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

This section carries 51 marks

Make bold sketches to illustrate your answer wherever possible. You are advised to spend not longer than 1 hour 15 minutes on this section.

1 **(a)** Each of the metals listed below are used in the metalwork shop. For each metal state its composition and one property.

(i) Mild steel

(ii) Wrought iron

(iii) Bell metal

(iv) Pewter

(v) Gilding metal [10]

(b)

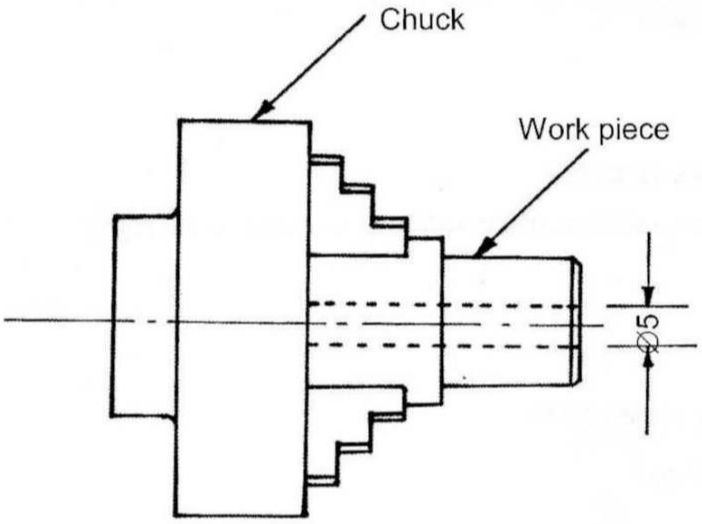


Figure 1

Figure 1 shows part of a machine vice turned on the lathe machine. Explain how to drill a hole of ∅5mm using the lathe machine before parting off. [7]

2 (a) Complete the table below by filling in the space for joining methods listed below by stating the solder used, a flux, heat or temperature and one source of heat. Write your answers in the booklet provided.

	JOINING METHODS	SOLDER	FLUX	TEMPERTAURE	SOURCE OF HEAT
(i)	Brazing				
(ii)	Silver soldering				

[8]

(b) (i) With the aid of a sketch explain how the head of the ball pein hammer becomes a firm fixture on the shaft. [4]

(ii) An hacksaw is a cutting tool used to cut metals in the workshop. List five (5) precautions you would observe in the use of a hand hacksaw. [5]

3 (a)

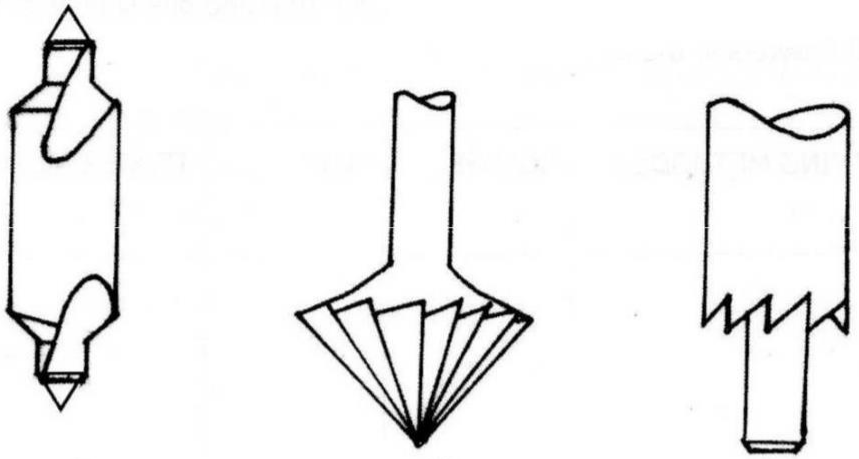


Figure 2

Figure 2 shows drills used on the drilling machine and lathe machine.

(i) Name each drill labeled **(i)** to **(iii)**. [3]

(ii) State two uses of the drill in 3 (a) (i) and state two precautions you would take to prevent drill breakage. [4]

(b) Briefly explain the terms **(i)** to **(v)**

(i) Hem

(ii) Wired edge

(iii) Shearing sheet metals

(iv) Punching sheet metal

(v) A pattern in sheet metal [5]

(c) Oxy-acetylene welding is one of the operations used in almost every school metalworkshop.

(i) Name the colours for acetylene and oxygen hoses. [2]

(ii) List three precautions you would observe when gas welding. [3]

4 **(a)** *Figure 3* shows a dish made of copper and was made by beating down over a wood or metal block.

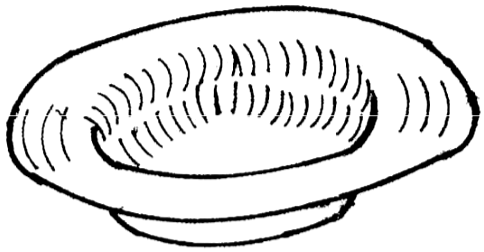


Figure 3

(i) Explain the process of sinking the dish. [5]

(ii) After planishing, the dish needs to be polished. Name two (2) mops and one (1) brush you would use to polish the dish. [3]

(b) The following are some of the screw thread terms:

(i) crest

(ii) root

(iii) pitch

(iv) lead

(v) multiple start thread

For each of the above five (5) terms explain what they mean. [5]

(c)

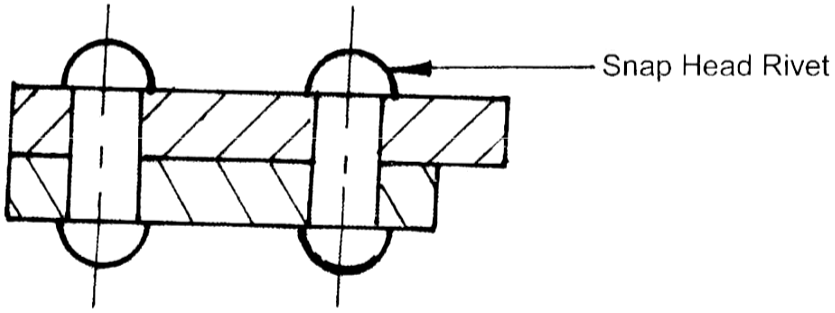


Figure 4

Figure 4 shows two (2) mild steel pieces assembled by means of snap head rivets.

(i) If the two (2) pieces are to be dismantled, explain how you would remove the heads of the snap head rivets. [2]

(ii) What are the allowances for forming a round head and for filing a counter sinking in riveting. [2]

5

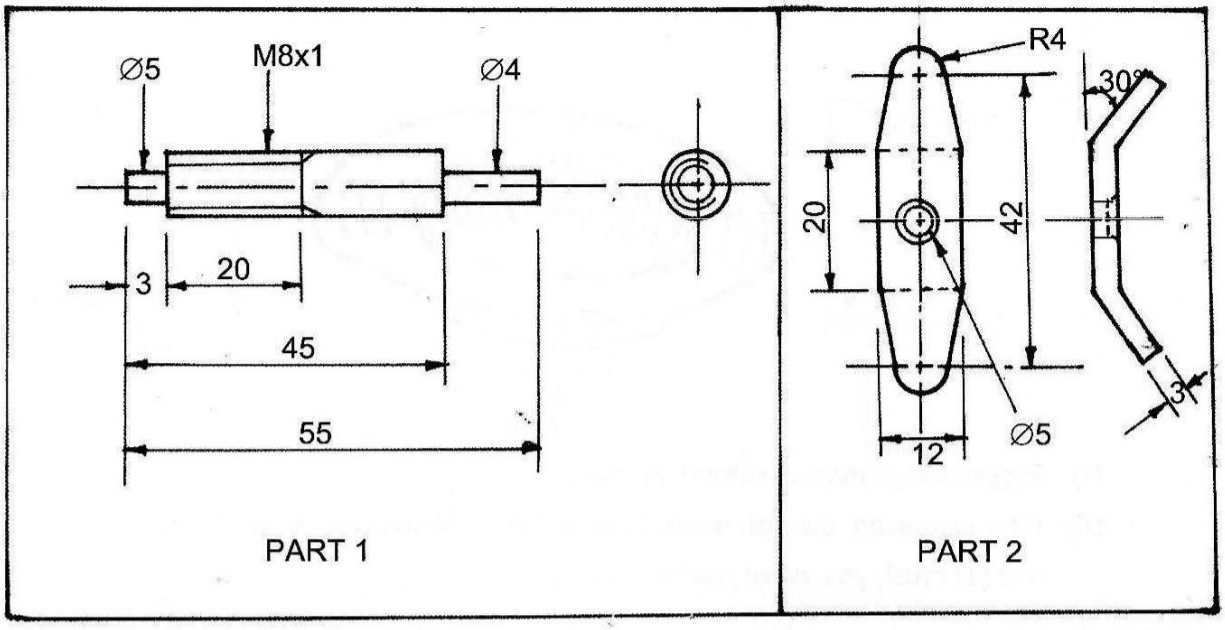


Figure 5

Figure 5 shows parts of a model cotton bale packer. Part is to be riveted to part 2 before filling flush.

(a) **(i)** What is the difference between a die nut and a circular die. [2]

(ii) M8 x 1 threads are to be made on Part 1, describe how you would cut the threads. [6]

(b) Explain how you would bend Part 2 to angle of 30° in a vice. [4]

(c) Name five (5) marking out tools you would use to mark out details on Part 2. [5]

Section B Drawing and Design

Answer **all** questions in this section.

This section carries 49 marks

You are advised to spend 1hour 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.

Use only one side of the paper.

Use the space to the right of the line to make your freehand sketches solutions in answer to question 6.

Use your own discretion for any dimensions not given.

A guide to the allocation of marks is given at the end of this section.

6 (a) *Figure 6* shows incomplete details of a PIPE CUTTER made from High Carbon Steel.

Figure 7 shows the front elevation of a movable jaw. The arrangement enables, the jaw to move forward and backwards. During cutting the pipe is clamped between the rollers on the movable jaw and cutter.

To the right of the line on your paper make a series of freehand sketches leading to the solution of the design problems (a), (b) and (c).

It should be possible for the examiner to understand your solutions fully by reference to your sketches only.

Brief notes should be added only to identify details such as; sizes of threads, materials etc

You may make modifications to the given component in order to solve the design problems.

Methods of assembly should not include welding, soldering or the use of adhesives.

Design Problems.

(a) A means of attaching the spindle to the body of the cutter so that it is able to push the movable Jaw forward and backwards.

(b) A means of attaching the spindle to the movable Jaw so that it is able to move with the movable Jaw.

(c) A means of turning the spindle.

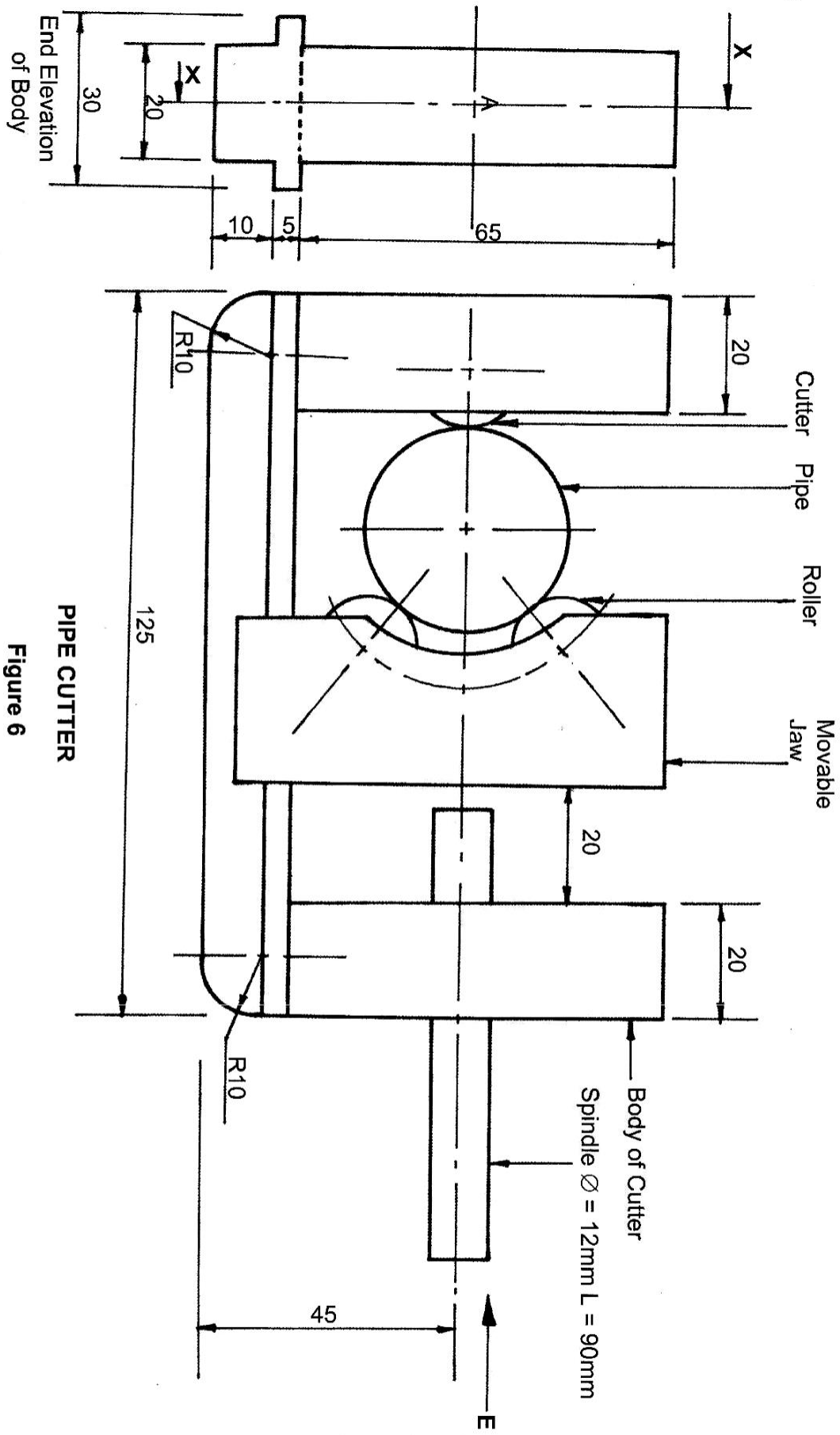
7 Draw full size in First or Third angle projection the following views of the PIPE CUTTER including details of your solutions to the design problem in question 6.

In your solutions to question 7 do not include the rollers, pipes and cutter. The distance between the movable Jaw and the right hand side of the cutter should be 20mm.

(a) A Sectional Front elevation showing the pipe cutter in question 6.

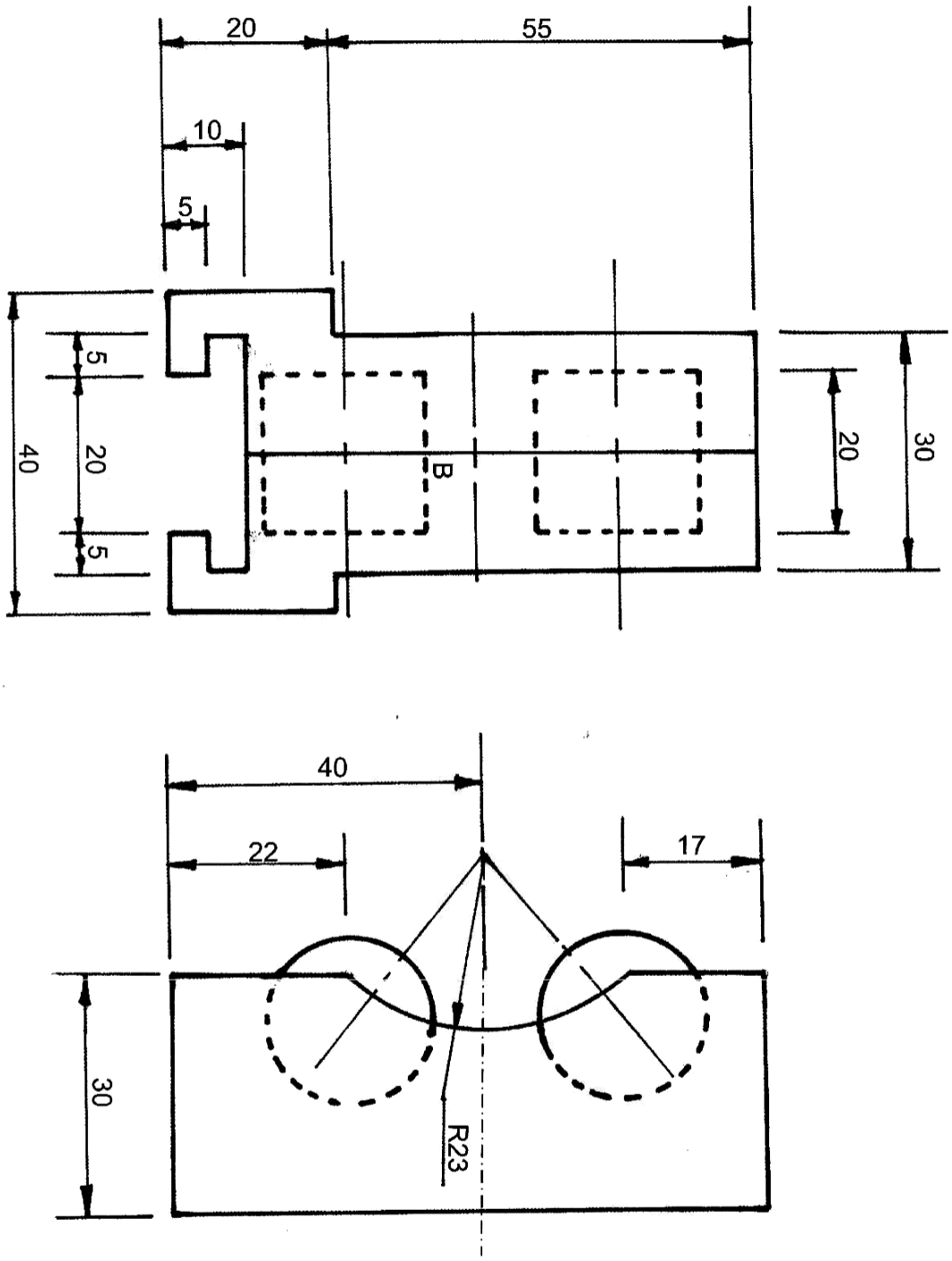
(b) An end elevation in the direction of arrow 'E'.

Mark allocation
Communication [20]
Design [29]



PIPE CUTTER

Figure 6



MOVABLE JAW

Figure 7