3.17 METALWORK (445)

3.17.1 Metalwork Paper 1 (445/1)

SECTION A (40 marks)

*Answer **all** the questions in this section in the spaces provided.*

1 (a) Define the term "apprentice" as applied in the engineering field. (1 mark)

(b) Explain the term "break-even" as used in business. (1 mark)

2 (a) List **three** uses of a steel rule. ($1\frac{1}{2}$ marks)

(b) (i) With the aid of sketches, distinguish between a dot punch and centre punch. (2 marks)

(ii) State **two** uses of a dot punch. (1 mark)

3 (a) State **two** reasons for edge treatment on sheet metal articles. (2 marks)

(b) Outline the procedure of finishing a work piece by painting. (2 marks)

4 (a) Outline the process of case hardening a vee block. ($2\frac{1}{2}$ marks)

(b) State **two** effects of each of the following alloying elements on iron:

(i) chromium; (1 mark)

(ii) manganese. (1 mark)

5 (a) Define the term "upsetting" as used in forging. (1 mark)

(b) State **two** reasons for twisting metal bars. (2 marks)

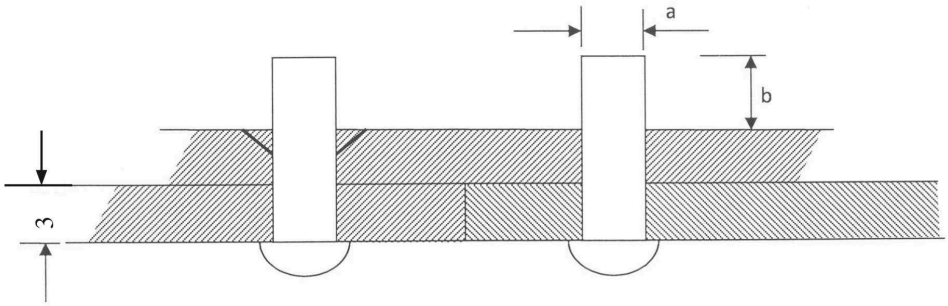
6 (a) With respect to needle files, state:

(i) their use; (1 mark)

(ii) the reason for not fitting a handle; (1 mark)

(iii) the reason for knurling one end. (1 mark)

(b) **Figure 1** shows two mild steel plates of equal thickness to be rivetted.



Determine:

(i) rivet diameter marked a;
(ii) heading allowance marked b.

(3 marks)

7 (a) State the:

(i) effect of prolonged heating in brazing; (1 mark)
(ii) reason for concentrating heat on the thicker piece of metal when brazing two metals. (1 mark)

(b) With reference to arc welding:

(i) define the term "tack welding"; ($1\frac{1}{2}$ marks)
(ii) state the use of tacks. ($1\frac{1}{2}$ marks)

8 With the aid of labelled sketches, distinguish between parallel turning and facing in lathe work. (3 marks)

9 State **four** possible causes of burns in a workshop. (2 marks)

10 **Figure 2** shows an isometric drawing of a block. Sketch in third angle projection, the orthographic views of the block. (6 marks)

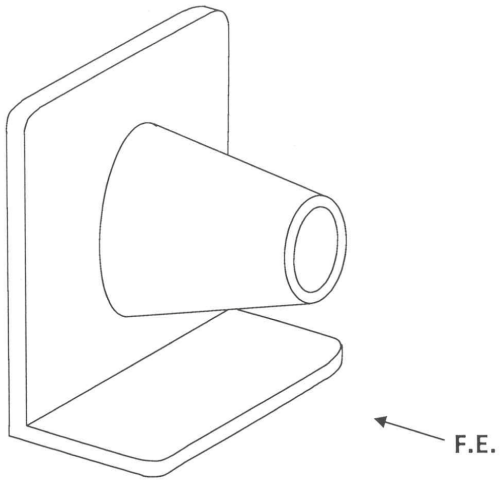


Figure 2

SECTION B (60 marks)

Answer question 11 and any other three questions from this section.
Candidates are advised to spend not more than 25 minutes on question 11.

11 **Figure 3** shows two views of a machined component drawn in first angle projection.

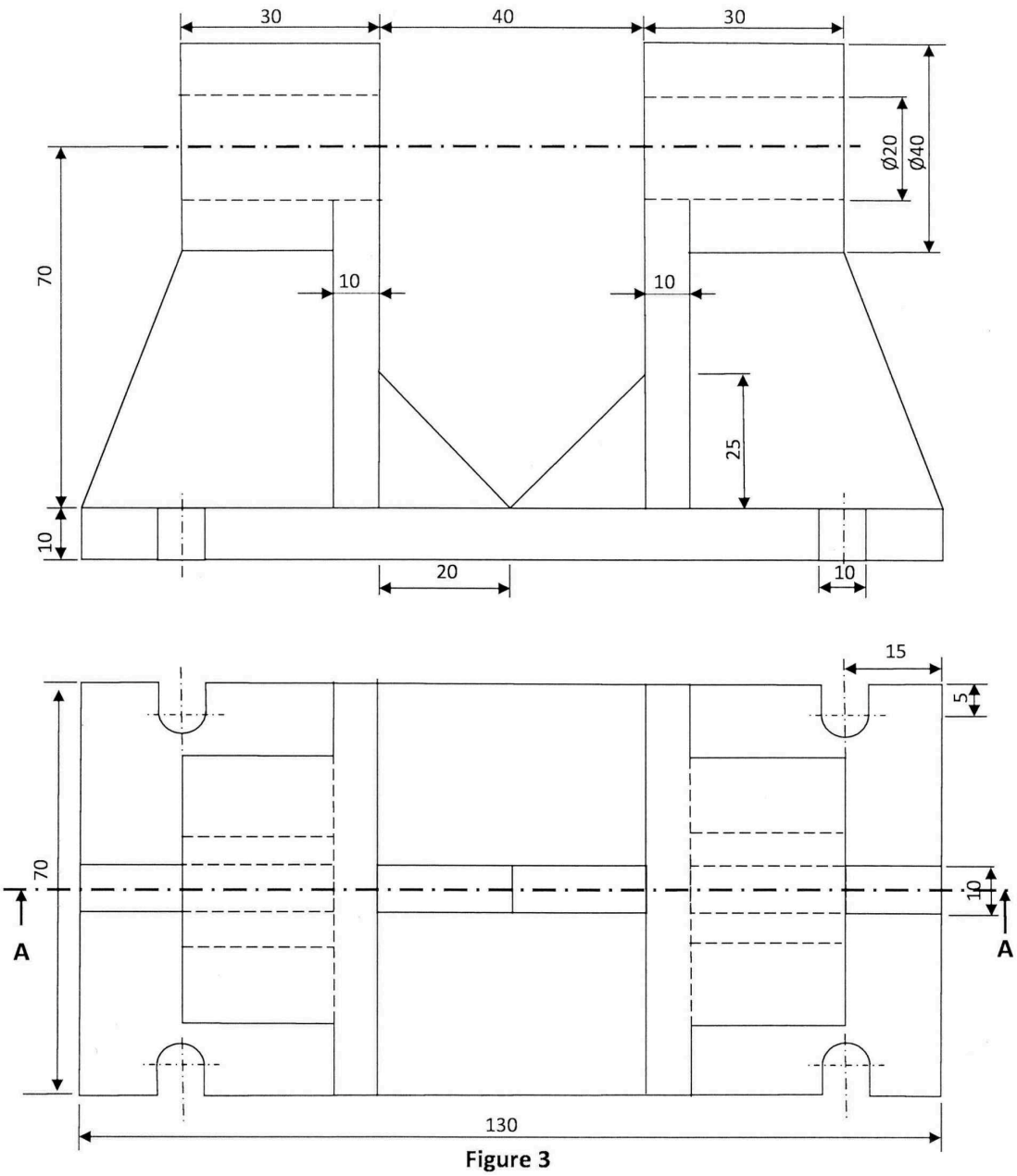


Figure 3

Draw full size, the following views:

(i) sectional front elevation through A - A.
(ii) end elevation. (Include hidden details).

(15 marks)

12 (a) State **four** safety precautions to be observed before switching on power supply of an electric arc welding equipment. (4 marks)

(b) With respect to arc welding:

(i) state the **two** methods of striking the arc; (1 mark)

(ii) give **one** advantage and **one** disadvantage of using each method. (4 marks)

(c) Name and illustrate **four** welding defects. (6 marks)

13 (a) With the aid of sketches, explain the procedure of drilling a hole on a centre lathe machine. (10 marks)

(b) State and sketch **two** methods of producing a short taper on a lathe machine. (5 marks)

14 (a) Outline the procedure of cutting internal threads on a round bar using a die stock. (5 marks)

(b) Name and sketch the three thread taps which make a set. ($4\frac{1}{2}$ marks)

(c) Sketch in pictorial a hand file and label all its parts. ($5\frac{1}{2}$ marks)

15 (a) State **two** causes for each of the following problems in drilling:

(i) worn out corners of cutting edges on a twist drill; (2 marks)

(ii) chipped cutting lips; (2 marks)

(iii) rough walls of a drilled hole. (2 marks)

(b) With the aid of labelled sketches show how:

(i) a centre punch is ground on a grinding wheel. ($4\frac{1}{2}$ marks)

(ii) the grinding lines should appear on the ground surface of the centre punch. ($1\frac{1}{2}$ marks)

(c) State **three** safety precautions to be observed when grinding. (3 marks)