

METALWORK 2

1. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) Majority of the candidates were able to state one function of each of the given parts of the lathe machine.
- (2) Majority of the candidates explained the reason for alloying metals.
- (3) Candidates correctly listed the quenching media used in heat treatment.

2. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Majority of the candidates could not describe how tinplate and galvanised sheet are produced.
- (2) Majority of the candidates sketched poorly the fastening devices: stud and flat head rivet.
- (3) Some candidates could not make a freehand sketch of a mushroomed head chisel.

3. SUGGESTED REMEDIES FOR THE WEAKNESSES

- (1) Candidates should ensure that they cover every aspect of the syllabus.
- (2) Students should be engaged in series of workshop activities in metalwork

4. DETAILED COMMENTS QUESTION 1

(a) State one function of each of the following parts of the lathe machine:

Most candidates answered this question but only a few performed well.

Majority of the candidates were able to state one function of each of the given parts of the lathe machine in 1ai, ii, iii and iv. Some responses included;

(i) headstock;

The headstock holds and revolves the workpiece.

(ii) tailstock;

The tailstock holds and supports workpieces and other accessories (e.g. drills, boring bar, reamers and centres).

(iii) bed;

The bed is the base which supports the headstock, tailstock and the carriage.

(iv) carriage;

The carriage forms the saddle of the machine that moves the cross-slide and the tool post.

(b) (i) Define the term safety as applied in metalwork.

The term safety as applied in metalwork was generally well defined by some candidates. They stated safety as measures or precautions taken to prevent one from injuries and damage to tools and equipment in the workshop.

(ii) List five means of conveying information on safety in the workshop.

The five means of conveying information on safety in the workshop as demanded in the question were not clearly listed by majority of the candidates.

A good number of the candidates rather stated safety measures.

In conveying information on safety, candidates were required to list; charts, circular, notices, posters, diagrams, videos, billboards and pictures amongst others.

QUESTION 2

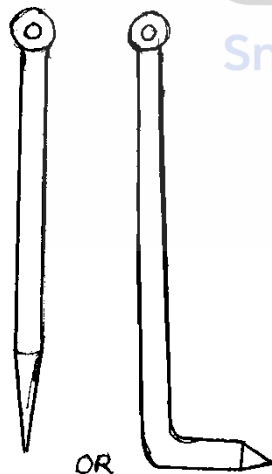
(a) Make a freehand pictorial sketch of each of the following forging tools:

Most candidates answered this question on making a freehand pictorial sketch of each of the following forging tools; poker and spade.

Some of the sketches provided were two-dimensional instead of three-dimensional (i.e., pictorial)

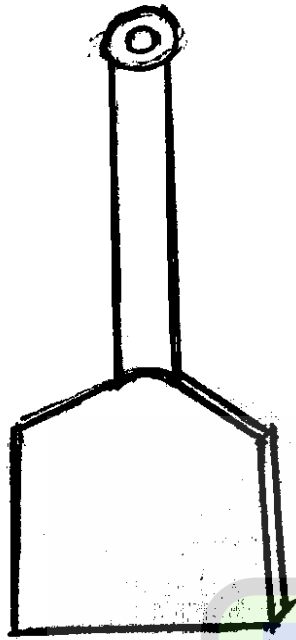
(i) poker;

The required sketches is shown below;



(ii) spade;

The required sketches are shown below;



(b) (i) Explain the term soaking as used in heat treatment.

The performance of candidates on explaining the term “soaking” was very good.

The expected response is:

Soaking is the process of allowing a heated metal to remain in heat for a specific period of time.

(ii) List two quenching media in heat treatment.

The two quenching media used in heat treatment were correctly listed to include; water, brine, oil, ashes, air and sand.

(c) State one reason for finishing a metal surface.

This part of the question, required the candidates to state one reason for finishing a metal surface. Generally, it was well answered.

Some expected responses included; to improve the metal surface, for decorative purposes, to ensure corrosion resistance, to ensure wear resistance and to ensure chemical resistance

QUESTION 3

3. (a) Explain each of the following properties of green sand;

- (i) refractoriness**
- (ii) compactibility**
- (iii) permeability**

(b) List six stages of the design process.

Most of the candidates attempted this question and scored good marks. (a-b) performance was average.

The expected responses are:

- (i) refractoriness is the ability of the green sand to withstand high temperatures generated by the molten metal without breaking.
- (ii) compatibility is the ability of green sand to change its shape to conform to the pattern without breaking.
- (iii) permeability is the ability of green sand to allow air and fumes to escape during casting.

QUESTION 4

4. (a) Describe how the following metals are produced

Majority of the candidates did not attempt this question.

(ai-iii) candidates who attempted this part of the question scored low marks, because they were not able to clearly describe how the metals in 4ai, ii, and iii are produced.

The expected answers are;

- (i) **ternplate**

Ternplate - coating a sheet of mild steel plate with lead to prevent it from corrosion.

- (ii) **tinplate**

Tinplate – coating a sheet of mild steel plate is coated with zinc to prevent it from corrosion.

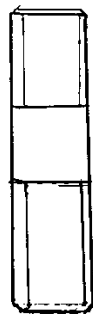
- (iii) **galvanized sheet**

Galvanized sheet- when a mild steel plate is coated with zinc to prevent it from corrosion.

b. Make a freehand two-dimensional sketch of each of the following fastening devices.

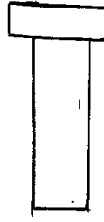
The required sketches are shown below:

i.



Stud

ii.



Flat head rivet

QUESTION 5

(a) Explain the reason for alloying metals.

Candidates were able to explain the reason for alloying metals.

The expected response is:

Metals are alloyed in order to improve their properties.

(b) State the name of one metal from which each of the following items are made:

This was a popular question.

A few of the candidates could state one metal from which each of the following items are made as follows;

- i. Body of a vice - cast iron
- ii. Taps - high carbon steel
- iii. Soldering bit head – copper
- iv. Battery terminals – lead
- v. Food containers – tinplate/aluminium

(c) (i) Make a freehand pictorial sketch of a mushroomed head chisel.

Some candidates could not make a freehand sketch of a mushroomed head chisel.

The required sketch is shown below;



Mushroomed head chisel

(ii) Explain how a mushroomed head chisel is corrected.

A mushroomed head chisel is corrected by grinding off on the grinding machine and not filed or chiselled as some candidates suggested.

METALWORK 3

1. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) Candidates provided correct interpretation of detailed drawings.
- (2) Candidates were able to cut and file both the male vee-shape and female vee-slot to fit together.
- (3) Candidates were able to produce the specified relief holes to facilitate assembling of parts.
- (4) Majority of the candidates were able to produce the final product.

2. A SUMMARY OF CANDIDATES' WEAKNESSES

Candidates' weaknesses include the following:

- (1) failure to start with marking out of views of work on the metal plate provided;
- (2) inaccuracies developed in the usage of steel rule;
- (3) poor usage of cutting tools (chisels and hacksaw);
- (4) failure to locate correct positions for drilling of holes;
- (5) failure to remove burrs and sharp edges after filing.

3. SUGGESTED REMEDIES FOR THE WEAKNESSES

- (1) Candidates should be effectively trained on the usage of hand and bench tools.
- (2) Candidates should be given sufficient time at the workshop for practical training.
- (3) Candidates should use smooth files to remove all sharp edge and finally deburr the finished product.
- (4) Students should be given regular assignments to practise on the machines tools like drilling machine and centre lathe machine.

4. DETAILED COMMENTS

The paper consisted of two questions; Question 1 was a fitting exercise and Question 2 was a machining exercise and candidates were required to answer only one of the questions for maximum 100 marks for a perfect work submitted for marking.

QUESTION 1

The following materials are supplied:

- a) One flat mild steel plate, 70mm x 60mm x 3mm (2 off)
- b) One cotton bag, 100mm x 100mm to enclose the finished work
- c) Two tie-on labels

Figure 1 shows the assembly and detailed views of each part of a fitting exercise.

Using the materials supplied, prepare the parts and assemble the pieces.

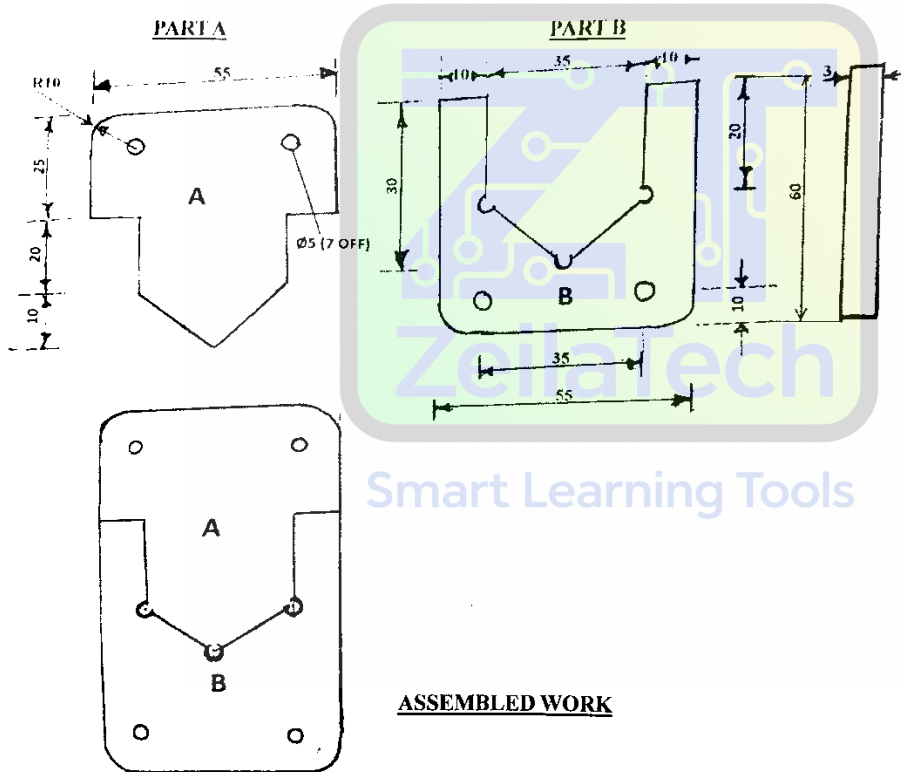


Figure 1

This was a popular question which majority of the candidates attempted to answer.

The candidates were supplied with (a) one flat mild steel plate, measuring 70mm x 60mm x 3mm (2 off), (b) one cotton bag, 100mm x 100mm to enclose the finished work and (c) two tie-on labels.

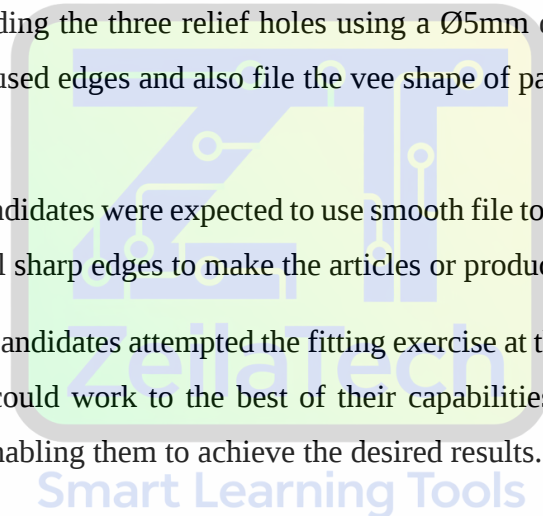
Candidates were expected to start by marking out on the workpiece the detailed views per the dimension to obtain the accurate profiles of the exercise given.

After obtaining the correct scribed profiles of the given views, candidates were required to dot punch the marked-out profiles to represent clear and better, views ready for cutting out. Candidates were expected to select appropriate cutting out tools to perform the work in a decent manner.

Candidates were further expected to mark out the various positions per the dimensions given to drill the seven holes including the three relief holes using a Ø5mm drill. Candidates were again required to file all the radiused edges and also file the vee shape of part A and file vee slot of part B.

As part of the finishing, candidates were expected to use smooth file to file close to the dot punched lines and finally remove all sharp edges to make the articles or product for safe handling.

Majority of the registered candidates attempted the fitting exercise at the expense of the machining exercise. The candidates could work to the best of their capabilities, some adhering to refined technical principles thus enabling them to achieve the desired results.

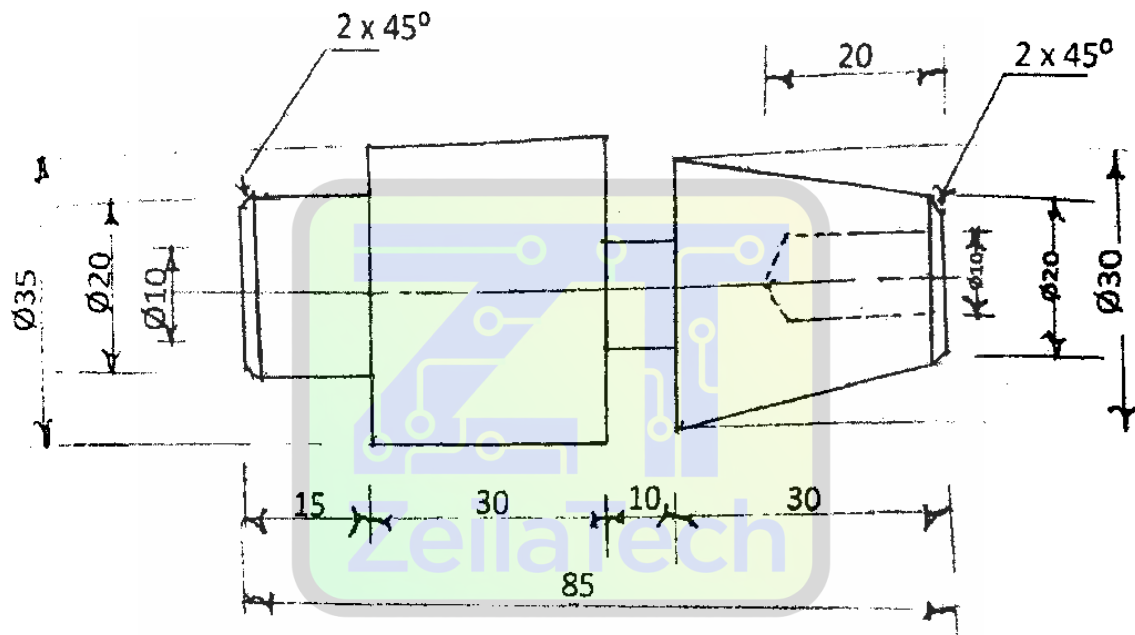


QUESTION 2

The following material were supplied:

- One piece free cutting mild steel rod $\text{Ø}40\text{mm} \times 90\text{mm}$
- One cotton bag $100\text{mm} \times 100\text{mm}$ to enclose the finished work
- Two tie-on labels

Figure 2 shows the detailed view of a machined part.
Produce the part using the material supplied.



NOTE

- Not drawn to scale
- All dimensions in mm
- Tolerance $\pm 0.5 \text{ mm}$

Figure 2

Candidates failed to attempt this question even though it is highly achievable.

Candidates were first required to machine the two ends of the 90mm rod to a length of 85mm specified.

After completing the facing, the taper end of the work could be turned with work held in chuck and engaging the compound slide, set it up to correct angle of taper to cut to length 30mm x max $\varnothing 30$ x min. $\varnothing 20$ mm.

Thereafter candidates were required to employ a recess tool or a parting off tool to generate the $\varnothing 10$ mm x 10 mm undercut.

Upon completion, the $\varnothing 35$ mm x 30mm length could be parallel turned.

Again, candidates were expected to step turn $\varnothing 20$ mm x 15mm length of the rod. The $\varnothing 10$ mm hole x 20mm depth could be drilled from the tapered end of the rod.

The workpiece ought to be completed by chamfering the two ends of the rod to 2mm x 45°.

After ensuring good condition of machine tool and using the right accessories, candidates could work to the tolerance of ± 0.5 mm specified to obtain the maximum 100 marks allotted for the question.

