

RESUME OF THE REPORTS OF THE TECHNICAL SUBJECTS

1. STANDARD OF THE QUESTION PAPERS

All the Chief Examiners agreement that the questions covered topics specified in the syllabuses and the difficulty levels were appropriate for the candidates.

2. PERFORMANCE OF THE CANDIDATES

The Chief Examiners were of the view that performance of candidates varied. Whilst they reported improvement in Auto Mechanics 1 and Metalwork 2, there was a downward trend in performance for Music 1 and 2.

They further reported that performance remained the same for Auto Mechanics 2, Metalwork 1, Applied Electricity 1 and 2, Building Construction 1 and 2, Electronics 1 and 2, Technical Drawing 1 and 2 and Woodwork 2.

3. A SUMMARY OF CANDIDATES' STRENGTHS

The Chief Examiners reported that some candidates performed remarkably well in the following areas:

(1) GOOD ORGANISATIONAL WORK

It was mentioned in Metalwork 2 and Building Construction 1 that candidates organized their answers in an orderly manner.

(2) GOOD COMMUNICATION SKILLS

Candidates were commended for using relevant terminologies, sound and logical ideas in Auto Mechanics 1 and Building Construction 1.

(3) GOOD THEORETICAL BACKGROUND

The responses provided by some candidates for Auto Mechanics 2, Electronics 1 and 2, Applied Electricity 1 and 2, Building Construction 2, Music 1 and Technical Drawing 2 showed that candidates had good understanding of the subject matter and were familiar with musical notes.

(4) OBSERVANCE OF SAFETY RULES AND REGULATIONS

Candidates for Auto Mechanics 1, Electronics 1 and Metalwork 1 observed good safety rules and regulations.

(5) DEMONSTRATION OF GOOD PRACTICAL SKILLS

Candidates' good and perfect finish of workpieces, understanding of circuit diagrams, good hearing abilities, mastery on the piano and interpretation of isometric block into orthographic projections were noted for Applied Electricity 1, Electronics 1, Music 1 and 2, Technical Drawing 1 and Woodwork 1.

Candidates for Technical Drawing 1 and 2 exhibited good draughtmanship skills and pencil work.

4. A SUMMARY OF CANDIDATES' WEAKNESSES

The Chief Examiners identified the following weaknesses in the work of candidates:

(1) POOR USAGE OF THE ENGLISH LANGUAGE

It was pointed out that some candidates for Auto Mechanics 2 and Metalwork 2 showed limited vocabulary in the English Language and thus could not convey their ideas well.

(2) INADEQUATE PREPARATION FOR THE EXAMINATION

Some candidates reportedly did not prepare sufficiently for the examination. This was noted for Electronics 2 and Technical Drawing 1. Candidates for Auto Mechanics 1 were reported to have exhibited lack of confidence in their approach to certain tasks. For Auto Mechanics 2, Metalwork 2 and Woodwork 3, it was reported that candidates produced poor sketches. The Chief Examiners further indicated that candidates for Woodwork 1 submitted incomplete work for assessment.

Candidates for Metalwork 2, Electronics 1 and Building Construction 1 were reported to have provided irrelevant material. It was also mentioned that candidates for Metalwork 2 and Electronics 2 provided answers which lacked clarity and they also lumped their answers together, making them difficult to understand.

(3) LACK OF IN-DEPTH UNDERSTANDING OF SUBJECT MATTER

Some candidates for Auto Mechanics 1, Technical Drawing 2, Music 1 and Building Construction 2 showed lack of understanding and knowledge to carry out certain tasks.

(4) POOR PRACTICAL SKILLS

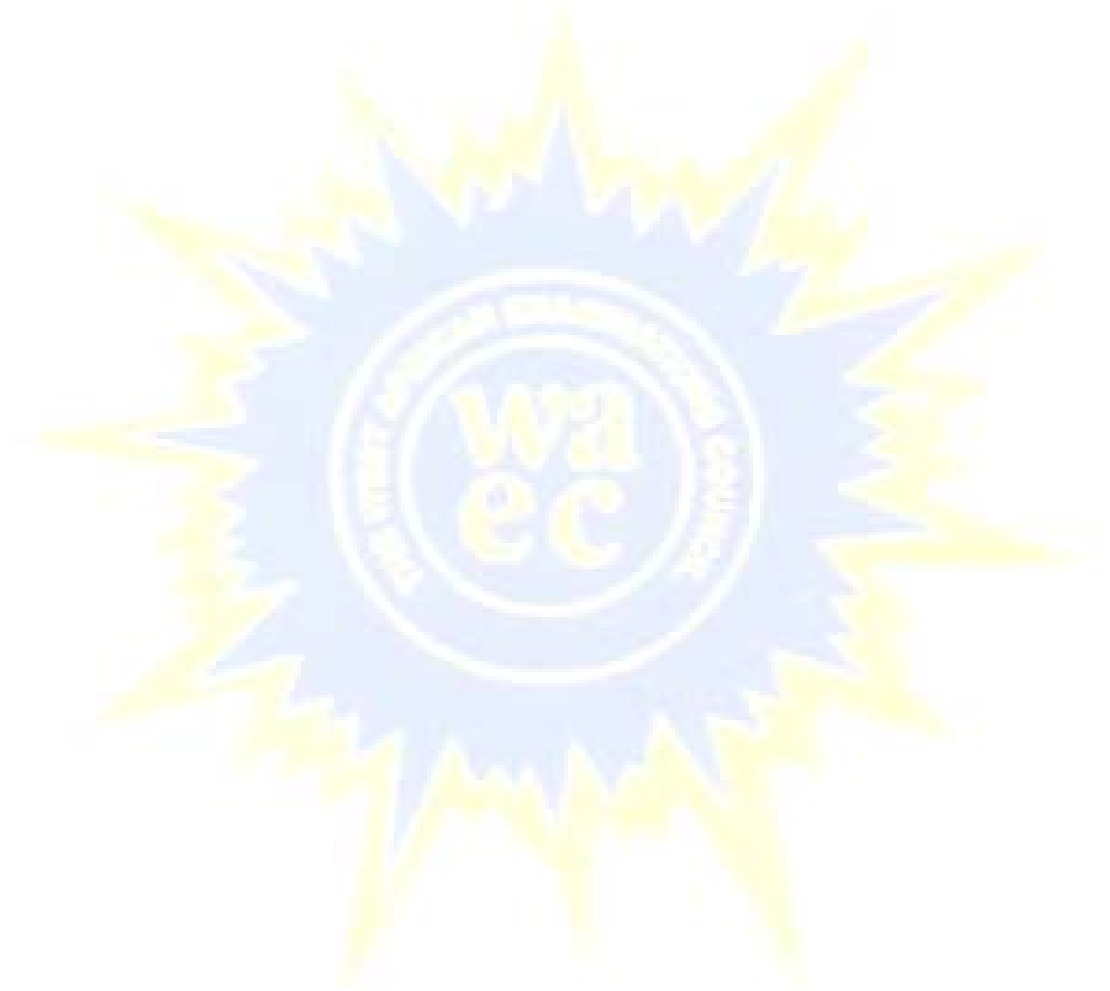
Candidates' inability to use electronic instruments, inability to interpret drawings and the use of blunt cutting tools were noted for Electronics 1, Building Construction 1, Metalwork 1 and Technical Drawing 1. It was specified that some candidates for Music 1 and 2 could not produce good melody writing.

It was also mentioned that candidates for Technical Drawing 2 showed poor pencil work whilst those for Metalwork 1 produced poor finish of workpieces.

5. SUGGESTED REMEDIES

The Chief Examiners submitted the following suggestions to help candidates overcome the weaknesses highlighted:

- (1) Candidates should make conscious effort to cover the greater part of the syllabus and should revise their notes frequently.
- (2) Candidates should expand their vocabulary base by taking their lessons in English Language seriously.
- (3) Candidates should be exposed to more practical activities by attaching themselves to garages, workshops, building contractors and draughtsmen.



APPLIED ELECTRICITY 1

1. GENERAL COMMENTS

The standard of the paper was comparable to that of the previous years. Candidates' performance was the same as the previous years'.

2. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) The majority of candidates connected the circuit diagrams accurately.
- (2) Candidates understood the principle underlying the operations of the circuit diagrams.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) The majority of the candidates' had wrong shapes of graphs due to inaccurate results obtained from the experiments.
- (2) Many candidates had difficulty converting lower units to higher ones, examples: microamps to amps, etc.

4. SUGGESTED REMEDIES

- (1) Candidates should do more exercises on how to select scales for plotting values obtained in experiments.
- (2) Candidates should read more textbooks on Applied Electricity to broaden their knowledge base in the subject.
- (3) Candidates should do more practical exercises in order for them to be conversant with the use of measuring instruments and their equipment.

5. DETAILED COMMENTS

Candidates were provided with the following apparatus:

one 100 Ω , 5W wire-wound resistor;
one filament lamp, 12 V 24 W;
two milliammeters (0-500 mA);
one voltmeter (0 - 15 V);
one variable d.c. power supply, Vs (0 - 12 V);
one single-pole switch, S;
one breadboard (or its equivalent);
connecting wires.

Question 1

AIM: The aim of both experiments is to determine the value of an unknown resistance.

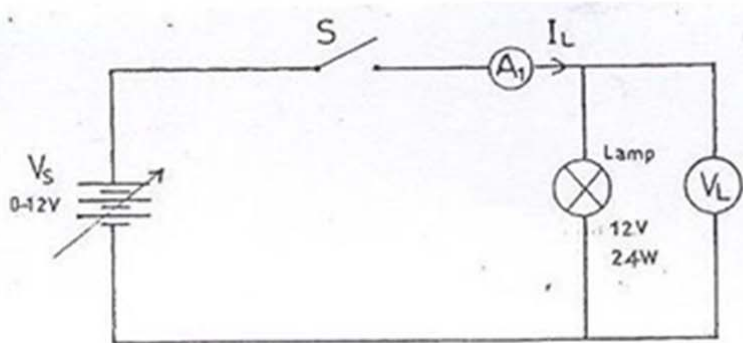


Figure 1

- Connect the circuit as shown in Figure 1.
- Ask the supervisor to check the circuit.
- Copy Table 1 below.

V_s (V)	V_L (V)	I_L (mA)	I_L^2 (mA) ²	$V_L I_L$ (W)
0				
2				
4				
6				
8				
10				

- Adjust the variable power supply V_s to 0V.
- Close switch S.
- Read and record the voltmeter reading V_L and ammeter reading, I_L into Table 1.
- Increase the variable power supply V_s by 2V and record the ammeter and voltmeter readings into Table 1.
- Repeat step (g) in steps of 2V as shown in Table 1.
- Open switch S.

- (j) Complete Table 1 from the corresponding values of V_L and I_L .
- (k) Plot a graph of $V_L I_L$ (W) on the y-axis against I_L^2 (mA)² on the x-axis.
- (l) Determine the slope of the graph.
- (m) What does the slope represent?
- (n) State any two precautionary measures taken during this experiment.

Candidates varied the voltage in steps of 2V and read the corresponding ammeter readings as indicated in the table provided. Some candidates could not obtain the load voltage (V_L) correctly and resorted to forging figures. This affected the graphical points for the plotting of the graph.

Performance of candidates was average.

Question 2

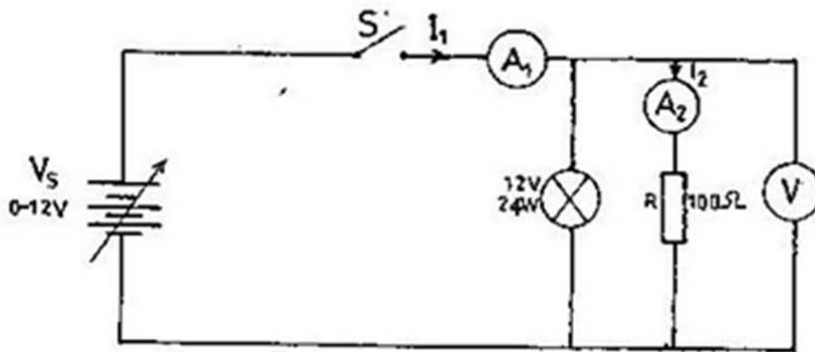


Figure 2

- (a) Connect the circuit as shown in Figure 2.
- (b) Ask the supervisor to check the circuit.
- (c) Copy Table 2 below:

V_s (V)	V(V)	I_1 (mA)	I_2 (mA)	$I_1 - I_2$ (mA)
0				
2				
4				
6				
8				
10				

- d) Adjust the variable power supply to 0V.
- e) Close switch S.

- (f) Read and record the voltmeter reading I_1 , I_2 and voltmeter reading, V into Table 2.
- (g) Increase the variable power supply V_s by 2V and record the ammeter and voltmeter readings into Table 2.
- (h) Repeat step (g) in steps of 2V as shown in Table 2.
- (i) Open switch S.
- (j) Complete Table 2.
- (k) Plot a graph of voltage (V) on the y-axis against current ($I_1 - I_2$) (mA) on the x-axis.
- (l) Determine the slope K of the graph.
- (m) Compare the slope in experiment 1 with that of experiment 2.

In experiment 2, the majority of candidates understood the principle that when current (I) is varied, resistance remains constant.

Most of the candidates could not plot the graph through the best fit points. Candidates' performance was very good.



APPLIED ELECTRICITY 2

1. GENERAL COMMENTS

The standard of the paper is comparable to that of the previous years'.
Candidates' performance was generally average.

2. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) The majority of candidates drew good graphs as demanded in the question.
- (2) Many of them were more conversant with electrical installation works.
- (3) Candidates stated clearly the advantages and disadvantages of single and three-phase installations.
- (4) Candidates were able to state the different types of d.c generators with precision.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Candidates could not attach the correct units to solved electrical quantities.
- (2) Many of the candidates did not know the difference between generators and motors.
- (3) The majority of candidates could not define correctly synchronous speed and their applications.
- (4) Candidates were not able to change radians to degrees to solve basic electrical problems.

4. SUGGESTED REMEDIES

- (1) Candidates should know that generated e.m.f. (E) and the terminal voltage (V) of a generator are not the same.
- (2) Candidates should learn how to select correct scales for plotting graphs.

5. DETAILED COMMENTS

Question 1

- (a) **Define permeability of a magnetic material.**
- (b) **An iron ring of mean circumference 50 cm and a cross-sectional area 1 cm² is wound uniformly with 400 turns of wire. If a current of 0.07 A flows in the windings with a flux of 6×10^{-6} Wb, calculate the:**
 - (i) **magnetomotive force;**
 - (ii) **flux density B;**
 - (iii) **magnetic field strength H.**

Most of the candidates attempted this question.

Candidates quoted the correct formula for the magnetic circuit.

A few of the candidates had much difficulty in converting centimetres (cm), centimetre-square (cm²) to metres (m). The S.I. units for the following quantities are as follows:

- (i) magnetomotive force (mmf) - Amperes(A)

- (ii) flux density (B) - Tesla (T)
 - (iii) magnetic field strength (H) - Ampere per metre (A/m)
- Performance of candidates was good.

Question 2

- (a) (i) **Define synchronous speed.**
- (ii) **List three applications of synchronous motor.**
- (b) **A synchronous machine with 4 poles is connected to a 50 Hz supply.**
Calculate the synchronous speed of the machine.

Many candidates responded poorly to the definition of synchronous speed and typical applications of synchronous motors. However, they calculated the synchronous speed of the machine without much difficulty.

Question 3

An alternating voltage is given by $v = 655.8 \sin (628t - 0.36)$ volts.
Calculate the:

- (a) **r.m.s. voltage;**
- (b) **frequency;**
- (c) **instantaneous value of voltage when t equals 4 ms;**
- (d) **phase angle.**

Most of the candidates were able to calculate the r.m.s. voltage and the frequency from the given equation.: $v = 655.8 \sin (628t - 0.36)$ volts
Few candidates could not calculate the instantaneous value because they could not convert radians to degrees.

The general performance of candidates was average.

Question 4

- (a) **State two methods of field excitation in d.c. generators.**
- (b) **State two types of d.c. generators.**
- (c) **A separately-excited d.c generator with 2Ω armature resistance is connected to an 80Ω load that takes a current of 10 A.**
Calculate the terminal voltage.

Most candidates answered this question, especially the methods of field excitation in d.c. generators and types of generators in practice.

The majority of candidates failed to recognize the fact that the generator mentioned was that of separately excited, hence the terminal voltage is calculated using the formula: $V = I_L R_L$, where I_L is the load current and R_L is the load resistance.

Question 5

A parallel-plate capacitor separated by a sheet of mica is connected across a 230 V supply. The mica has a thickness of 0.45 mm and a relative permittivity of 7. The area of each plate is 800 cm².

Calculate the :

- (a) capacitance of the capacitor;
- (b) charge on the capacitor;
- (c) potential gradient (or the electric field strength);
- (d) electric flux density in the dielectric.

(Take the permittivity of free space as $8.854 \times 10^{-12} \text{F/m}$)

Many candidates quoted correctly the formulae for calculating the following quantities:

- (i) capacitance $(C) = \frac{\epsilon_1 \epsilon_0 A}{d}$;
- (ii) charge $Q = CV$;
- (iii) potential gradient $E = \frac{V}{d}$
- (iv) electric flux density $= \rho \frac{V}{d}$

However, solving each equation was difficult for most of them due to the manipulation of indices.

Performance of candidates was good.

Question 6

- (a) State two advantages of the three-phase system over the single -phase system.
- (b) State two advantages and two disadvantages of a rewirable fuse.
- (c) List two protective devices used in an electrical installation work.

Most of the candidates answered this question.

They stated the advantages of the three-phase system over the single phase system in an electrical network including the protective devices used.

Performance of candidates was good.

AUTO MECHANICS 1

1. GENERAL COMMENTS

The standard of the paper was within the scope of the syllabus and compares favourably with that of the previous years. The rubrics were clear and there were no ambiguities in the questions. However, performance of candidates varied from high to low.

Generally, candidates' performance was slightly above that of the previous year.

2. A SUMMARY OF CANDIDATES' STRENGTHS

Candidates exhibited the following commendable features among others, in their responses:

- (1) Candidates adhered strictly to the appropriate safety rules and regulations.
- (2) Candidates selected the appropriate tools for each task assigned to them.
- (3) Candidates performed the various tasks in sequential manner and worked within the time allotted.
- (4) Some candidates showed good communication skills by using the relevant terminologies in answer to questions posed to them.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

Candidates' weaknesses were found in the following areas:

- (1) Lack of confidence in the performance of some of the tasks.
- (2) Lack of practical skills in performing some of the tasks. This showed that candidates did not have enough practical lessons.
- (3) Candidates showed lack of theoretical knowledge in certain areas of the syllabus, e.g. mechanical fuel pump.

4. SUGGESTED REMEDIES

- (1) Instructors and Subject Teachers should combine theory with practical demonstrations when teaching certain topics.
- (2) Candidates should be exposed to more practical activities to be familiar with certain components/parts of the vehicle. Candidates are advised to attach themselves to well-equipped workshops and garages during vacation.
- (3) Candidates should do their best to get a variety of textbooks and other periodicals on Auto Mechanics to read.
- (4) Candidates should make the conscious effort to complete the syllabus before writing the paper.

5. DETAILED COMMENTS

Question 1

- (a) **Inspect the casing of the mechanical fuel pump provided.
Report to the Examiner.**
- (b) **Dismantle the pump. Report to the Examiner.**
- (c) **Check the condition of the two valves and seats.**

- Report to the Examiner.**
- (d) Remove the diaphragm.**
Report to the Examiner.
- (e) Examine the condition of the diaphragm and spring.**
Report to the Examiner.
- (f) Refit the diaphragm.**
Report to the Examiner.
- (g) Reassemble the pump.**
Report to the Examiner.
- (h) Test the pump for functionality.**
Report to the Examiner.
- (i) Answer two relevant oral questions from the Examiner.**

(a) Candidates were expected to point out cracks and blocked air bleeding or vent underneath the pump. Most of the candidates performed well in this question.

(b) The desired procedure for dismantling the pump was followed by candidates but some omitted marking the outer casing to facilitate reassembling.

(c) The valves must be checked for dirt, wear and signs of leakage. Most of the candidates generally lacked these basic ideas.

(d) and (e) The removal and examination of the condition of the diaphragm was easy for most of the candidates for parts (d) and (e).

(f) Candidates were familiar with the diaphragm and refitted it with ease. Some of them however took a great deal of time refitting the diaphragm and nearly perforated it with screw driver.

(g) Reassembling of the pump was properly handled by the candidates. The screw points were aligned and the screws tightened.

Some of the candidates however reassembled the pump in the reverse order.

(h) The candidates had only a fair idea about testing the pump for functionality.

Their approach of drawing petrol with their mouth to fill the chamber of the pump was unhealthy and unorthodox. In a simple test to access the functionality of the mechanical fuel pump, the pump should be immersed in a clean petrol.

The lever is operated a few times to prime the pump. It is then emptied and suction side sealed off with a finger whilst the lever is operated a couple of times. If the pump is in a good condition, a suction noise would be heard.

(i) Candidates' answers to oral questions posed to them varied from excellent to poor.

(j) The handling of tools and observation of safety rule was fairly good.

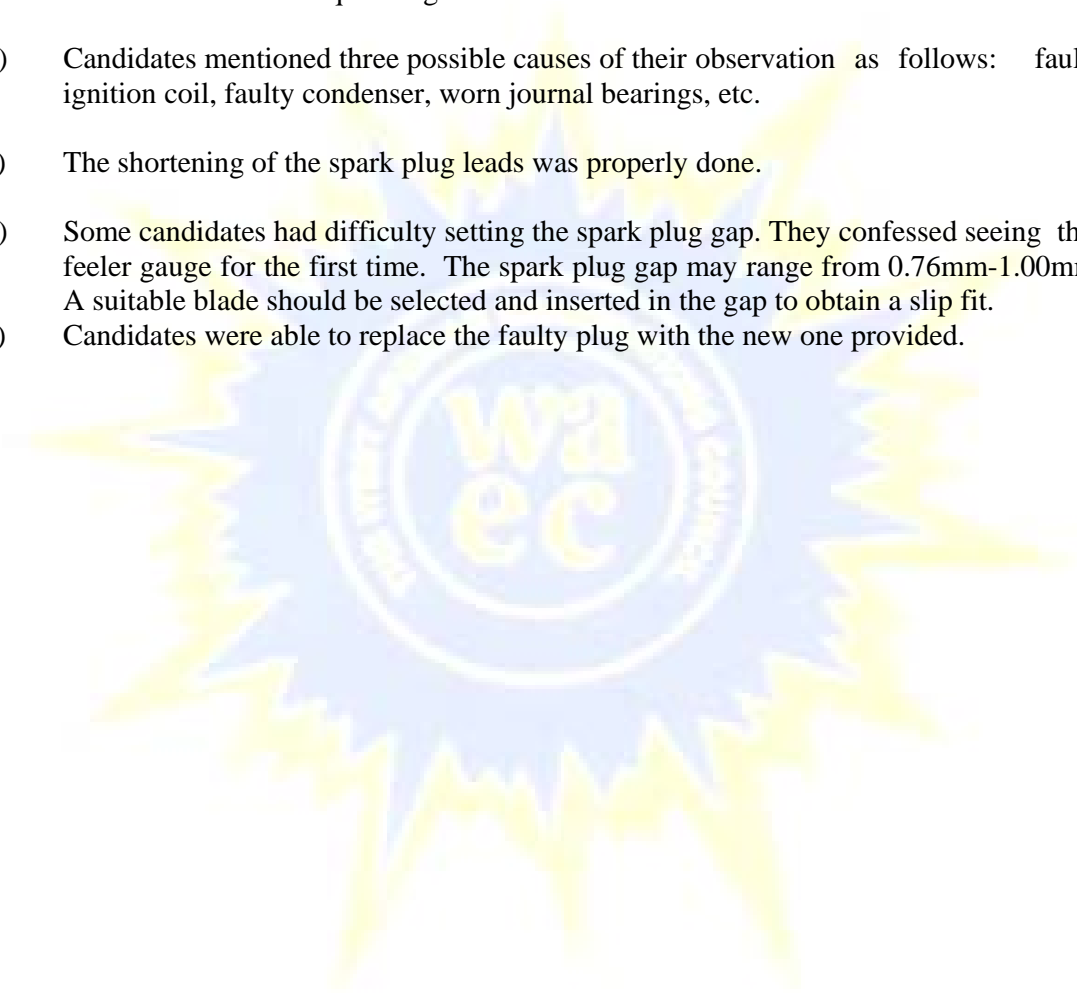
Question 2

From the running petrol engine provided:

- (a) Observe its operation. Report to the Examiner.**
- (b) Mention three possible causes of your observation to the Examiner.**

- (c) **Remove the spark plug leads one after the other and report your observations to the Examiner.**
- (d) **Locate and remove the faulty plug. Report to the Examiner.**
- (e) **Set the gap of the plug provided to the specification given by the Examiner. Report to the Examiner.**
- (f) **Replace the faulty plug with the one provided. Report to the Examiner.**
- (g) **Answer two relevant oral questions from the Examiner.**

- (a) The running petrol engine was initially observed and listened to by all the candidates and afterward a spark plug was rendered inoperative. The candidates detected the abnormal sound of the engine and passed their comments. In other instances, candidates noted the squeaking noise from the worn fan belt.
- (b) Candidates mentioned three possible causes of their observation as follows: faulty ignition coil, faulty condenser, worn journal bearings, etc.
- (c) The shortening of the spark plug leads was properly done.
- (d) Some candidates had difficulty setting the spark plug gap. They confessed seeing the feeler gauge for the first time. The spark plug gap may range from 0.76mm-1.00mm. A suitable blade should be selected and inserted in the gap to obtain a slip fit.
- (e) Candidates were able to replace the faulty plug with the new one provided.



AUTO MECHANICS 2

1. GENERAL COMMENTS

The standard of the paper has remained the same over the years. The questions were very clear and met the expectation of candidates.

The performance of candidates was not different from the previous year's.

There were some candidates who showed exceptional brilliance.

2. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) Some candidates exhibited good theoretical background in their answers.
- (2) Candidates' answers were clear and precise.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Candidates' sketches were poor which showed that they had not been practising the art of sketching.
- (2) Some candidates were limited in their vocabulary and therefore could not convey their ideas well on paper.
- (3) Some candidates were lopsided as they failed to answer questions from other sections of the syllabus.

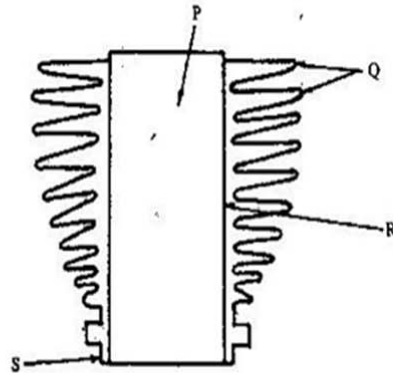
4. SUGGESTED REMEDIES

- (1) Candidates are advised to prepare adequately by covering a greater part of the syllabus.
They should from time to time revisit some topics treated in the lower classes to refresh their memory.
- (2) Candidates should expand their vocabulary base by reading their textbooks, story books and magazines.
- (3) Teachers and candidates are advised to apportion some of their lessons for workshop practice since the subject is a practical-oriented one.

5. DETAILED COMMENTS

Question 1

The sketch below is a component of an air-cooled engine.



- (a) (i) Identify the sketch.
(ii) Identify the parts labelled P, Q, R and S.
- (b) State three advantages of an air-cooled engine over the water-cooled type.
- (c) State why multicylinder in-line engines are not commonly air-cooled.
- (d) State the purpose of a thermostat in a water cooled engine.

- (a) Identification of the sketch was easily done by candidates. They went ahead to name the parts indicated on the cylinder block of an air-cooled engine correctly; P as cylinder bore, Q as fins, R as cylinder liner and S as locating spigot.
- (b) The advantages of an air-cooled engine posed no difficulty for the candidates.
- (c) Most candidates were not forthright in their explanation of this part of the question. They were required to state that multicylinder in-line engines are not commonly air-cooled because it is difficult to achieve even cooling of the cylinders. They wrote profusely without any substance.
- (d) Some candidates missed some points by stating that thermostat prevents circulation of water without commenting on its temperature regulating aspect.

Question 2

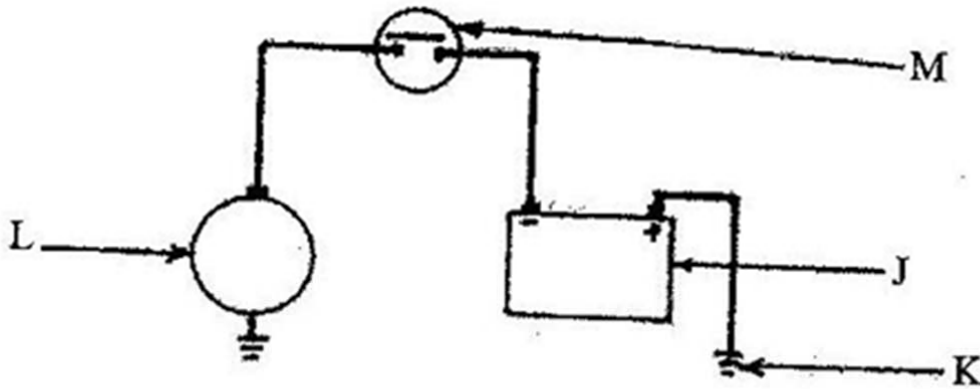
The data of an engine valve timing is as follows:
inlet valve opens 6° before top dead centre;
inlet valve closes 35° after bottom dead centre;
exhaust valve opens 38° before bottom dead centre;
exhaust valve closes 5° after top dead centre.

- (a) Draw the valve timing diagram.
- (b) Calculate:
- the overlap;
 - the total period the inlet valve remained closed after bottom dead centre;
 - the total period the exhaust valve was opened during the operation.

Just a minority of the candidates did the correct timing by drawing according to the data provided. Those who did the calculation of overlap excelled but essential aspects of the calculation based on the period the inlet valve remained closed after bottom dead centre (b.d.c.) and the total period the exhaust valve was opened were left unattended to.

Question 3

The sketch below is a simple starter circuit.



- (a) Identify the parts labelled J, K, L and M.
- (b) State the function of each of the following:
- fuse;
 - dipper switch.
- (c) (i) Sketch a lead-acid battery cell.
(ii) Label any three parts of the sketch in (c)(i).
- (a) Candidates correctly identified the parts indicated on the sketch.
- (b) A greater number of candidates showed gross ignorance in the question. Fuse is a safety device that protects a circuit from excess current and a dipper switch is used in the headlamp circuit to change the direction of current of the headlamp downward to the near side to give a dimmer light thus preventing dazzling of the on-coming driver.
- (c) Candidates did not grasp the demands of the question. Some of the candidates drew a three-dimensional battery whilst others drew a sketch showing the electrolysis of water.

Question 3

- (a) (i) **Sketch a gravity-feed fuel supply system.**
(ii) **Label any three parts.**
- (b) **Explain the operation of the gravity-feed fuel supply system.**
- (c) **State three reasons why the gravity-feed fuel supply system is not used on motor vehicles.**

The majority of candidates were attracted to this question but performance was just average.

- (a) Candidates are to note that in drawing a gravity-feed fuel supply system, the height of the tank relative to the engine position should not be at the same level. Some candidates placed both tank and engine on the same level or plane, thus rendering their sketches unworkable.
- (b) The operation of the gravity-feed fuel system was described vividly by many candidates.
- (c) Candidates could not come out strongly why the gravity-feed fuel supply system is not used on motor vehicles. Some of the reasons include the use of high bonnet for the tank outlet so that the tank will be above the carburetor inlet and any leakage would allow fuel to drip into the driver's compartment/engine which could cause fire.

Question 5

- (a) **Sketch a telescopic damper.**
- (b) **Label any three parts of the sketch in (a) above.**
- (c) **State three reasons for using leaf-springs on heavy commercial vehicles.**

Most of the sketches presented by candidates were haphazardly drawn and labelling the sketches was another problem they grappled with.

Candidates did well by providing correct answers why the leaf springs are used on commercial vehicles.

BUILDING CONSTRUCTION 1

1. GENERAL COMMENTS

The standard of the paper conforms to that of the previous years.

The questions covered a broad spectrum of the syllabus and they were adequate for a well-prepared candidate to excel. Candidates' performance as compared to the previous year's was the same.

2. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) A few of the candidates were able to express their opinions or ideas logically.
- (2) Some candidates also demonstrated their knowledge in the subject with good and well-labelled sketches.
- (3) Candidates numbered their answers clearly and wrote legibly.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Most candidates could not interpret the attached drawings and therefore could not answer the questions attached to it correctly.
- (2) Most candidates also could not present their ideas sequentially.

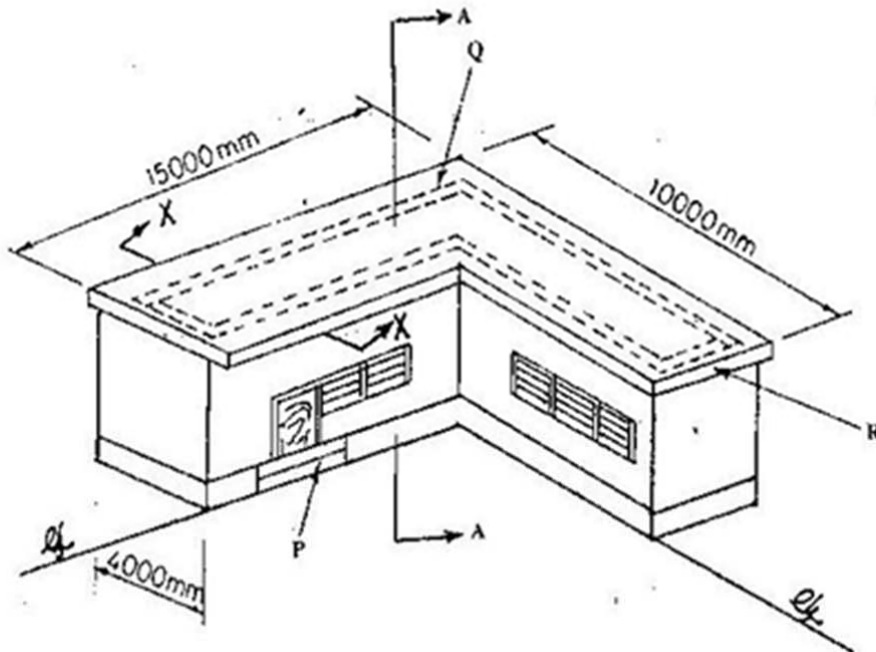
4. SUGGESTED REMEDIES

- (1) Teachers should help students to cover all the topics in the syllabus for better understanding of the subject.
- (2) There should be frequent visits to construction sites to enable candidates relate theory in the classroom to sitework for perfect correlation.
- (3) Candidates should not rely on sketches/drawings for practical exercises, but should involve themselves in constant practice to acquire skills in the building industry.

5. DETAILED COMMENTS

Question 1

The figure below shows a proposed domestic building with sandcrete block walls and reinforced concrete flat roof. The building is to be built on 3000 mm deep made-up ground. The proposed building is located 2800 mm from an existing building. Use the information provided to answer the following questions.



- (a) State three precautions to be taken when excavating for the substructural works for the building.
- (b) (i) Name a suitable foundation for the building.
(ii) Sketch a cross-section through the foundation named in (b)(i) above.
- (c) (i) Identify the elements labelled P, Q and R.
(ii) State one function of each of the elements P and Q.
- (d) (i) Sketch the cross-section X-X through the roof slab to illustrate the arrangement of the steel reinforcement.
(ii) Label two parts of the sketch in(d)(i) above.
(iii) Explain how a uniform concrete cover for the steel reinforcement in the roof slab is maintained.
- (e) List two items that must be in place before placing the steel reinforcement in a formwork for the roof slab.
- (f) With the aid of a sketch, describe how the rainwater from the roof is directed to a drain at ground level.

The majority of candidates gave reasonable answers in part (a).

In part (b)(i), a few of the candidates stated types of foundation which would not be suitable for the building. The suitable foundation for a made-up ground is the raft foundation.

(ii) Some candidates named the raft foundation correctly but could not sketch it. Steel reinforcement in the slab and the beam were not shown.

- (c) (i) Most candidates answered this question correctly. A few of them, however, wrongly identified element 'Q' as gutter and R as gable or parapet wall. The required answers were Q as block wall and R as concrete roof slab.
- (ii) A few candidates answered this question correctly.

Most candidates produced wrong sketches for (d) (i) and (ii). The correct procedure was to have the outline sketch of the beam showing the bottom and top steel reinforcement, with their distribution bars in place, and the labelling pointing to the actual items on the sketch.

(iii) Candidates could not present their ideas well. To obtain a uniform cover for the steel reinforcement in the slab, spacer blocks of the required thickness of the concrete cover are tied to the steel reinforcement which rests on the decking boards.

(e) Most candidates gave wrong responses. The required answers are conduit pipes, electrical wiring boxes, ceiling fan hooks/other fixtures.

(f) Candidates could not produce satisfactory sketches to solve the question. Candidates wrongly produced pitched roof instead of flat roof. In some cases, the external wall to receive the down pipe was omitted. The ground level and drain channel were poorly sketched. Candidates failed to use wall brackets to show how the down pipe is fastened to the wall.

Question 2

(a) **List four stages involved in establishing levels at a site between two datum levels using boning rods.**

(b) (i) **Sketch a sectional view to illustrate how subsoil moisture is prevented from rising to the floor of a raft foundation.**

(ii) **Describe a method of preventing soil erosion around a raft foundation.**

(c) **List three properties of a hardened concrete.**

(a) Candidates could not answer this question satisfactorily. The required steps are:

(i) draw the first levelling peg into the ground between the established datum,

(ii) stand one boning rod on the top of the first levelling peg,

(iii) stand a second boning rod on the top of the second levelling peg,

(iv) stand the third boning rod on the top of the datum and sight the tops of the boning rod,

(v) drive the levelling pegs into the ground until the top surface of the three boning rods are in alignment respectively with the site.

- (b) (i) Some candidates produced sketches showing wide strip and deep strip foundations without showing how to check moisture rising to a floor. The solutions they were to incorporate are:
- provision of damp proof membrane over blinding;
 - provision of hardcore or rubble on the soil;
 - indication of soil under the hardcore
- (ii) Many candidates provided very good answers.
- (c) Candidates gave fairly good information about properties of hardened concrete.

Question 3

- (a) **Sketch a section through a suspended timber ground floor and label the following parts:**
- (i) **air brick;**
 - (ii) **wall plate;**
 - (iii) **sleeper wall;**
 - (iv) **damp proof course in sleeper wall construction.**
- (b) **List in sequence, the ten stages involved in the manufacture of adobe block for wall construction.**
- (a) Some candidates did not meet the requirements of the question. The sketches of some candidates had the air brick wrongly positioned. The damp proof material was not laid over the sleeper wall but in between the sleeper wall. Some floor joints were shown (d) (i) and (ii) in concrete instead of timber.
- (b) Candidates added cement and used ratios meant for sandcrete blocks which is wrong. Adobe block is manufactured using soil. No cement is added. After excavation of soil, it is weathered, broken down by adding water, foreign materials are removed, kneaded and moulded.

Question 4

- (a) **List the stages involved in the manufacture of burnt clay bricks. Assume the clay material is in the workshop.**
- (b) (i) **Define the term cantilever beam.**
(ii) **Sketch to illustrate the arrangement of steel reinforcement in a cantilever beam.**
- (c) **List the stages involved in laying a four-course honeycomb sandcrete blockwall over an oversite concrete.**
- (a) The majority of candidates gave fairly good answers to the question.
- (b) (i) Most candidates could not give any convincing answer. The required answer is: a cantiliver beam is one that projects beyond the supporting column or the wall surface.

- (ii) Most candidates produced sketches of a simply supported beam with steel reinforcement. The correct solution is a sketch with the beam projecting beyond the support and having the following in the beam:
 - negative top steel bars in the span;
 - bottom steel bars in the beam and span;
 - stirrups/links for the cantilever and span.
- (c) Most candidates provided the right responses.

Question 5

- (a) **State three factors that tend to prevent flow of effluent in a drainage scheme.**
- (b) (i) **Sketch a section through a brick-lined soakaway pit.**
 (ii) **Label the following parts on the sketch in (b) (i) above.**
 - (α) **inlet pipe;**
 - (β) **honeycomb brick lining;**
 - (γ) **concrete foundation;**
 - (σ) **concrete cover slab.**
- (c) **State one safety precaution to be taken in an electrical circuit to prevent each of the following:**
 - (i) **damage to electrical appliance;**
 - (ii) **injury to user of electrical appliance.**
- (a) Fairly good responses were given by the majority of candidates.
- (b) Candidates were able to provide reasonable answers to the question. Few candidates however sketched a cesspool or an inspection chamber.
- (c) Candidates did not provide any good response. The required answer is; the use of circuit breaker or installation of fuse in the circuit is to break excess load. To the user of electrical appliance, earth wire incorporated in the electrical circuit is to take stagnant current into the ground.

Question 6

- (a) **Sketch a section through a timber flat roof construction and label the following parts:**
 - (i) **roof joist;**
 - (ii) **furring piece;**
 - (iii) **roof boarding;**
 - (iv) **bituminous felt.**
- (b) **Explain the difference between a lock and a latch.**
- (c) **List the stages involved in fixing a wooden door frame in an opening. Assume the walls are in place.**
- (a) Most candidates produced poor sketches.
 - the roof joist was wrongly placed on the sketch.
 - the position of the furring piece was also wrong.

- (b) The majority of candidates gave good responses to this question.
- (c) Different wrong answers were produced by candidates. In securing a frame in position, check the horizontal and vertical alignments of the frame before caulking it.

BUILDING CONSTRUCTION 2

1. GENERAL COMMENTS

The standard of the paper was comparable to that of the previous year, and covered the entire scope of the syllabus. The general performance was average.

2. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) Candidates showed appreciable knowledge and understanding of the subject matter.
- (2) Fairly good and clear answers were also provided by candidates.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Inadequate preparation for the examination.
- (2) Candidates could not express themselves meaningfully in the subject terminology or jargons.
- (3) Candidates lacked knowledge in the types of door used in construction works.

4. SUGGESTED REMEDIES

- (1) Candidates should be encouraged to read textbooks instead of relying on past questions. The past questions should be used to test their preparedness for the examination and not as a textbook.
- (2) Candidates should be exposed to practical work for them to relate theory to practice.

5. DETAILED COMMENTS

Question 1

- (a) **State one function of each of the following when setting out a building:**
 - (i) **profile board;**
 - (ii) **builders' square;**
 - (iii) **spirit level and straight edge.**
- (b) **State a suitable foundation for each of the following conditions:**
 - (i) **framed structure in moderately firm soil;**
 - (ii) **a storey building in a shrinkable clay soil;**
 - (iii) **load bearing wall in a firm soil.**
- (c) **List three stages involved in casting a concrete blinding in a foundation trench.**

The majority of candidates gave right answers to this question.

For part (c), a few of the candidates wrote about casting actual foundation concrete rather than blinding. The expected answers are:

- (i) level and ram the bottom of trench;
- (ii) peg the bottom of trench to obtain the correct thickness of the blinding layer.
- (iii) pour the concrete mix in the trench and compact to the pegged levels.

Question 6

- (a) **State the difference between in situ and precast as used in concrete work.**
- (b) **Explain the reason for performing each of the following operations in concrete production:**
 - (i) **batching of constituent materials;**
 - (ii) **mixing of batched materials;**
 - (iii) **curing of placed concrete.**
- (c) **State the conventional mix ratio for each of the following:**
 - (i) **mass concrete;**
 - (ii) **reinforced concrete.**
- (d) **Name one mechanical plant suitable for each of the following operations:**
 - (i) **site clearance;**
 - (ii) **trench excavation;**
 - (iii) **pit excavation;**
 - (iv) **earth moving.**

(a) Most candidates gave very good responses to this question.

(b) A few of the candidates were able to answer this question correctly. Most of them explained the operations instead of the reasons for them. The expected answers are to ensure that:

- (i) the constituent materials are accurately measured;
- (ii) the constituent materials are properly blended to achieve a uniform mass;
- (iii) sufficient moisture is available for hydration of the cement to achieve maximum strength.

Candidates generally gave encouraging answers to questions (c) and (d).

Question 3

- (a) **State two functions of a window.**
- (b) **Sketch a double-casement window and label four parts.**
- (c) **Describe in sequence, six stages involved in rendering a sandcrete blockwall.**

(a) Many of candidates presented very good answers to this question.

(b) Candidates produced sketches of different types of window instead of a simple double casement window.

(c) Most candidates were able to answer this question correctly.

Question 4

- (a) **State three functions of a ceiling in a building.**
- (b)
 - (i) **Name three parts of a ceiling construction.**
 - (ii) **List three materials used as ceiling covering.**
- (c) **State the difference between each of the following:**
 - (i) **flush door and panel door;**
 - (ii) **match boarded door and glazed panel door.**

Most candidates gave the correct answers to questions (a) and (b).

Most candidates could not give very good responses to these question (c)(i)&(ii). The expected answers are:

- (i) a flush door has a plain surface while a panel door has some mouldings and grooves or troughs or furrows on the surface.
- (ii) A match boarded door consist of wide strip of wood fixed side by side and braced together while a glazed panel door is made up of wood or metal stiles and glass.

Question 6

- (a) **State the difference between plastering and rendering.**
- (b) **List in sequence, the stages involved in applying a three-coat render to a sandcrete blockwall.**
- (c) **State four defects of painting.**
- (d) **Name two statutory personnel in a construction team.**

(a) Most of the candidates were able to give the correct answers to this question. A few of them however, interchanged the explanation of plastering and rendering.

(b) Most candidates were able to give the correct answers to this question. A few, however, wrote about mixing of mortar for blockwork instead of rendering.

(c) Candidates were able to provide the right answers to this question.

(d) Most candidates could not give the right responses to this question. They provided construction team in the building industry rather than the statutory personnel.

The correct team include City Engineer, Building Inspector, Town Planner, Inspector of Factories and Health Inspector.

ELECTRONICS 1

1. GENERAL COMMENTS

The standard of the paper was comparable to that of the previous years.
Performance of the candidates compared with that of the previous year.

2. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) Candidates presented their experimental results in a tabular form which conformed with the rubrics.
- (2) Most candidates had a good theoretical background about the circuit diagrams and successfully performed the two experiments with good results.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Candidates lacked the technique of reading measuring instruments correctly.
- (2) Some candidates were not familiar with the use of the electronic instruments and found it difficult to identify the polarity of the active components.
- (3) Most candidates wasted time by providing irrelevant information.

4. SUGGESTED REMEDIES

- (1) Candidates should be encouraged to use quick test board instead of soldering overboard.
- (2) Candidates are to be exposed to more laboratory work to build their confidence and skills in practical work.
- (3) Candidates should learn how to calibrate instruments for correct readings from experiments.

5. DETAILED COMMENTS

Candidates were provided with the following apparatus:

one variable d.c. power supply (0-50 V);
two multimeters;
one zener diode (5.6V);
two npn BD 137 transistors or its equivalent;
one 100 Ω , 1/2 W resistor;
one 10 k Ω , 1/2 W resistor;
one 10k Ω , variable resistor (potentiometer);
one soldering iron with resin-cored solder;
Veroboard/quick test board;
Connecting wires;
Long nose plier;
Side cutter

Question 1

AIM: To investigate the variable base resistor in zener-transistor regulating circuit.

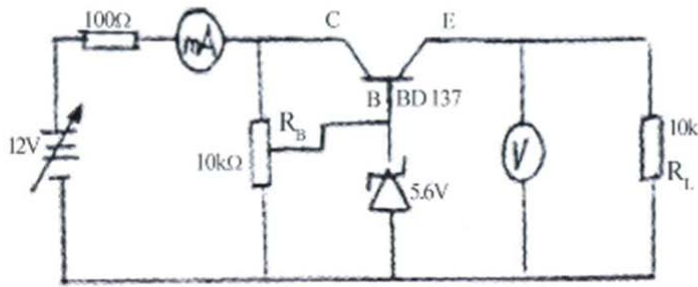


Fig. 2

- (a) Connect the circuit diagram as shown in figure 1.
- (b) Ask the supervisor to check the circuit connection.
- (c) Copy Table 1 into your answer booklet.

Resistance R_B (Ω)	1k Ω	2 k Ω	4 k Ω	6 k Ω	8 k Ω	10 k Ω
Current (mA)						
Voltage (V)						

- (d) Use the multimeter to measure the resistance of the potentiometer at 1k Ω
- (e) Switch on the power supply, measure and record the corresponding values of current (mA) and voltage (V) in Table 1
- (f) Switch off the power supply.
- (g) Repeat step (e) for the other values of R_B in Table 1.
- (h) Using the results in Table 1, plot a graph of voltage (V) on the vertical axis against current (mA) on the horizontal axis.
- (i) Comment briefly on the
 - (i) voltage and current readings;

(ii) **input and the output voltages.**

Experiment 1 tested the variable base resistor in zener-transistor regulating circuit. Most of the candidates who performed the experiment could not obtain the required results because of their inability to read values from the multimeter and potentiometer.

Candidates were able to get the required shape of the graph but their values were misplaced. Candidates' comments on the voltage and current readings were also misplaced. Candidates were expected to comment that current decreased with increase in resistance and voltage also increased with increase in current from 1mA to 2mA and thereafter remained steady.

Candidates' performance was not encouraging.

Question 2

AIM: To investigate the variable resistor for transistor regulating circuit.

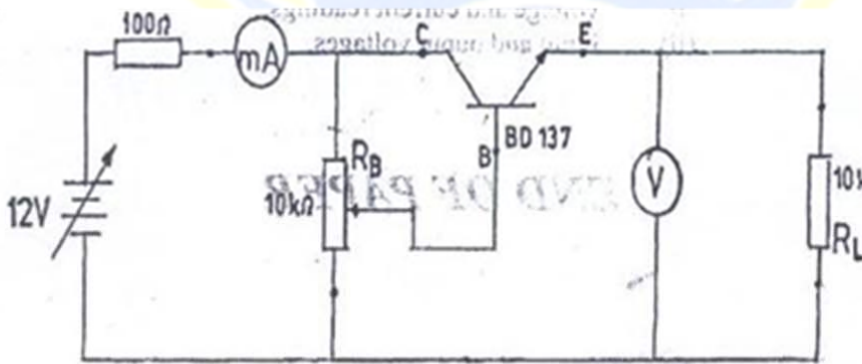


Figure 2

- (a) **Connect the circuit as shown in figure 2.**
- (b) **Ask the supervisor to check the circuit connection.**
- (c) **Copy Table 2 into your answer booklet.**

Table 2

Resistance R_B (Ω)	1k Ω	2 k Ω	4 k Ω	6 k Ω	8 k Ω	10 k Ω
Current (mA)						
Voltage (V)						

- (d) **Use the multimeter to measure the resistance of the potentiometer at 0.5 k Ω .**

- (e) **Switch on the power supply, measure and record the corresponding values of current (mA) and voltage (V) in Table 2.**
- (f) **Switch off the power supply.**
- (g) **Repeat step (e) for the other values of R_B in Table 2.**
- (h) **Comment briefly on the**
 - (i) **voltage and current readings;**
 - (ii) **input and output voltages.**

Experiment 2 tested the variable resistor for transistor regulating circuit.

Most candidates did not observe the difference between zener and resistor variable regulating circuit, same results in both experiments.

Candidates were required to know that with the resistor variable regulating circuit, voltage increased uniformly with increase in current. Input voltage also remained constant at 12V(D.C.) and output voltage increased uniformly from 0V to 10.54V.

Candidates' performance in this experiment was fair.



ELECTRONICS 2

1. GENERAL COMMENTS

The standard of the paper was good and compared favourably with that of the previous years.

The overall performance compared with that of the previous years.

2. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) Most of the candidates were able to define electronic terms precisely.
- (2) The majority of them had an indepth knowledge of D.C. circuits. (series-parallel circuit) and valves. (Pentode valve)
- (3) Many of the candidates had adequate knowledge of cathode-ray oscilloscope.
- (4) Candidates presented neat circuit diagrams to support their explanations.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Some of the candidates did not display any real knowledge and understanding of electronics.
- (2) Some also did not prepare adequately for the examination and thus performed poorly.
- (3) Some candidates' answers lacked clarity. They could not articulate their points clearly.

4. SUGGESTED REMEDIES

- (1) Candidates should prepare adequately by reading more textbooks on electronics to enhance their knowledge in the subject.
- (2) Candidates should be taught some examination techniques on how to answer questions.
- (3) Emphasis should be placed on the principle of operations of basic electronics components during preparation by students for examinations.

5. DETAILED COMMENTS

Question 1

- (a) **Explain the term thermionic emission.**
- (b) **Sketch and label the circuit symbol of the pentode valve.**
- (c) **State two advantages of the pentode valve over the triode valve.**

Most candidates were able to define thermionic emission in part (a).

For part (b), most of the candidates' responses to the question were quite good. Candidates were able to sketch and label the circuit symbol of the pentode valve.

Candidates' responses to question (c) was very poor. Few candidates were able to state two advantages of the pentode valve.

Candidates' performance was generally quite good.

Question 2

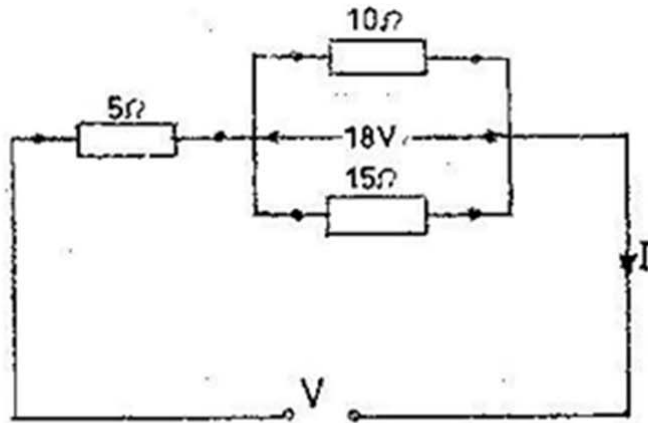


Figure 6

From figure 6 above, calculate the

- (a) total current (I);
- (b) supply voltage (V).

Candidates' responses to (a)&(b) were fairly good.

Some of the candidates were able to calculate the total current flowing through the circuit and the supply voltage.

Candidates' performance was quite good.

Question 3

- (a) Define the following terms:
 - (i) positive feedback;
 - (ii) negative feedback.
- (b) List two effects each of the terms in 3(a) on the operation of an amplifier.
- (c) State the difference between Class A and Class B amplifiers.

(a) The majority of candidates were able to define positive feedback. However, some candidates were not able to define negative feedback clearly, i.e feedback type in which the feedback signal is 180° out of phase with the input.

(b) This question was popular amongst the candidates. Performance of candidates was encouraging.

- (c) Some of the candidates could not state the difference between Class A and Class B amplifiers clearly, i.e The difference is that Class A amplifiers are biased with Q-point in the linear region whereas Class B amplifiers have their Q-points on the cut-off point.

Candidates' performance was commendable.

Question 4

- (a) **Define the following:**
(i) **frequency modulation;**
(ii) **amplitude modulation.**
- (b) **State three advantages each of**
(i) **F.M.**
(ii) **A.M.**

Most candidates could not respond appropriately to this question.

Question 5

- (a) **Explain the principle of electron beam deflection in a cathode ray oscilloscope.**
(b) **State two applications of the cathode ray oscilloscope.**
(c) **List four electrodes of the cathode ray oscilloscope.**

- (a) Most candidates attempted this question.
Performance of candidates was fair.
The majority of candidates who attempted this question did well but could not state the application adequately, i.e. viewing waveforms measurement of a.c or d.c currents and voltages, measuring frequencies, components testing and phase angle measurements. Performance of candidates was encouraging.

Question 6

- (a) **State**
(i) **Faraday's laws;**
(ii) **Lenz's law.**
- (b) **Write an expression for the value of induced e.m.f. across the terminals of a coil.**
- (c) **State two applications of electromagnetic induction.**

Most candidates attempted questions (a) and (b) but had difficulty in stating both *Faraday's* and *Lenz's* laws clearly.

For (c) however, most candidates were able to state the two applications of electromagnetic induction.

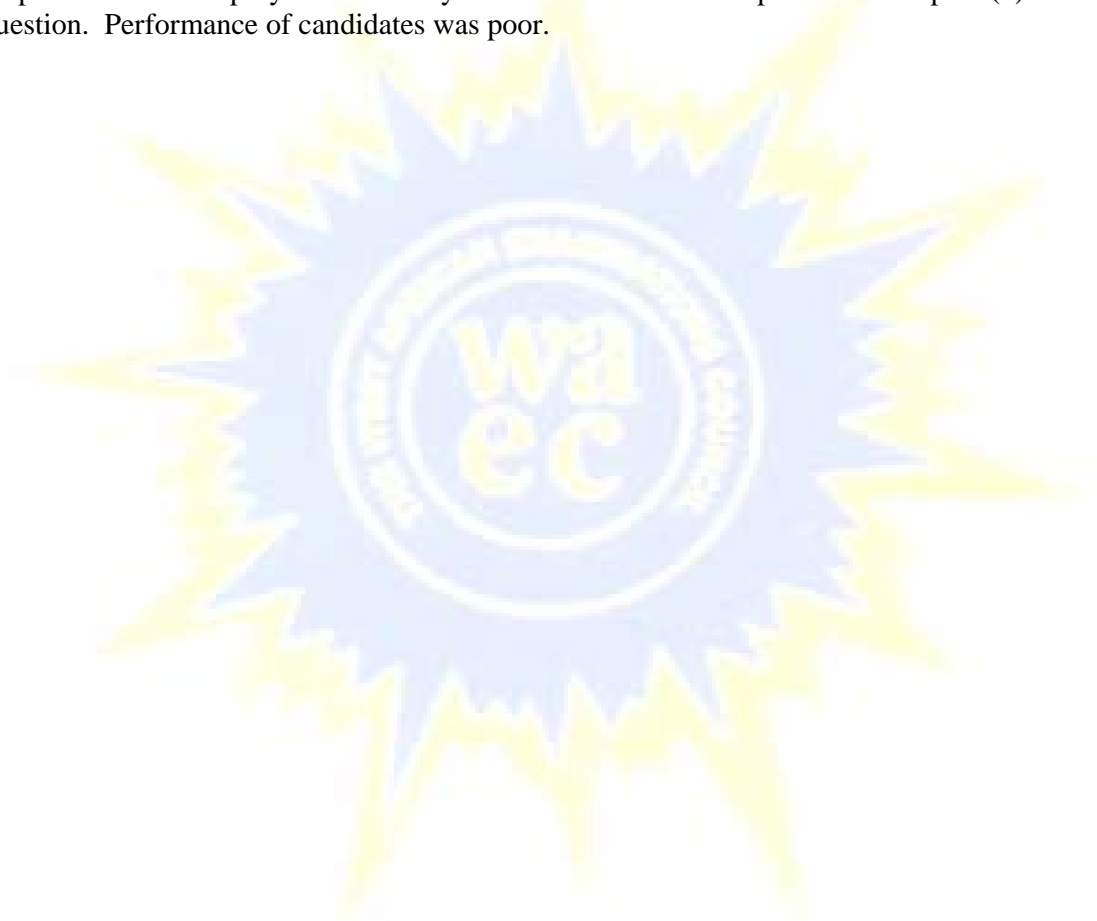
Performance of candidates was generally fair.

Question 7

- (a) **Draw the block diagrams of the following control systems:**
- (i) **open loop;**
 - (ii) **closed loop.**
- (b) **Explain briefly the differences between the open loop and closed loop control systems.**

Very few candidates attempted the first part of the question.

Most candidates were not able to draw the block diagrams of the control systems, i.e. open loop and closed loop systems. Many of them could not respond well to part (b) of the question. Performance of candidates was poor.



METALWORK 1

1. GENERAL COMMENTS

The standard of the paper was comparable to that of the previous years. The questions covered the topics specified in the syllabus and the difficulty level remained the same for the candidates. The performance of the candidates was satisfactory. They used the necessary skills to perform the exercise within the given time.

2. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) Most candidates produced all the parts to the specified dimensions and could assemble the parts together in their right positions.
- (2) The majority of candidates were able to cut the slot required on one of the parts with less difficulty.
- (3) The drilling exercises were perfectly performed. The correct positions of the holes were identified and properly located.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Finishing of candidates' work was poor. They failed to remove burrs on filed edges.
- (2) The squareness of the parts left much to be desired. The geometrical shape of the final product was not stressed but was considered slightly.
- (3) Some candidates could not assemble the finished parts with dowel pins because holes drilled were misaligned. In some instances, the dowel pins turned out to be rivets.
- (4) Some candidates also permanently rivetted the parts together, though the exercise did not require that.

4. SUGGESTED REMEDIES

- (1) Candidates should always remove sharp corners and edges (burrs) after filing in order to make their work safer to handle.
- (2) Candidates should learn how to achieve squareness of their work. They should first establish two reference edges before cutting and filing corresponding edges to the required dimensions and size. They should check for squareness as frequently as possible while filing to ensure well-shaped work.
- (3) Candidates should ensure that the ends of dowel pins are well-prepared. They should chamfer and round the two ends of the pins to the specified length.
- (4) Schools should upgrade their workshops with modern tools and equipment.

5. DETAILED COMMENTS

The examination consisted of two practical tests. Test A was a fitting exercise to be carried out on the bench using various hand tools.

Test B was a machining exercise involving various operations using the lathe machine.

Most of the candidates attempted the fitting exercise with quite a few of them doing the machining exercise.

TEST A - FITTING EXERCISE

Candidates were supplied with one piece mild steel plate, 103 mm x 103 mm x 3 mm (2 off) for parts 1 and 2. One mild steel plate, 43 mm x 23 mm x 3 mm (1 off) for part 3 and one piece mild steel rod Ø6 mm (3 off) for the execution of the exercise.

Basically, candidates were able to put both parts 1 and 2 together, cut and file to the required size after filing two datum, square and flat. They were to proceed to the next operation by marking the positions for the three dowel-pin holes and then drill the two plates together in their correctly marked positions.

Candidates were then required to remove one of the plates and mark out for the position for the slot. After that, then drilled along the marked profile and cut away the slug or waste part. They were to file off the metal projections to leave two relief holes and three sided rectangular slot 40 mm x 20 mm shape.

Candidates were required to prepare part 3 (40 mm x 20 mm) to fit into the slot when all parts were assembled. They were also to mark out the centre position of the fitting piece (part 3) and drill through the integral with the part 2 plate. Candidates were also to prepare dowel Ø6 mm x 6 mm to fix part 3 in position.

After assembling all the parts produced, candidates were required to finish the assembly by removing all sharp edges and burrs produced on the pieces.

TEST B - MACHINING EXERCISE

Candidates were supplied with one piece free cutting mild steel rod of length 75 mm and diameter 50 mm to produce the machine part according to the specifications given to them in the detailed drawing.

Candidates were expected to mount the workpiece in a chuck and face the two ends to the required length 70 mm. The workpiece could be held in the chuck and portion of the outside diameter turned down to 45 mm diameter. After this operation, candidates could change the workpiece and put the turned part which is 45 mm diameter in the chuck.

Candidates continued to reduce the rod size from 45 mm to 30 mm diameter to a length of 40 mm. From the face held in the chuck, they were required to under cut to a depth 2 mm, and 10 mm long as indicated on the drawing. The next operation

involved drilling the $\text{\O}12$ mm hole in the workpiece. After drilling, the end of the rod was to be chamfered.

Candidates were required to change the workpiece and hold from the 30 mm diameter shoulder at this stage to enable the knurling operation to be performed on 45 mm diameter end of the workpiece.

A diamond forming knurling tool was selected for the operation. The tool was held in the tool post set at right angle to the work.

The tool was fed into the work and moved across the length 30 mm. The operation was carried out slowly until the knurling was completely formed.

Both shoulders of the knurled part 30 mm long were chamfered to provide safe edges as indicated on the detailed drawing.

The workpiece was finally finished by cleaning and blowing all chips and debris.



METALWORK 2

1. GENERAL COMMENTS

The structure, composition and demands of the questions were similar to those of previous years.

Candidates' performance showed a marked improvement over that of the previous year.

2. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) Candidates organized their answers in a well-structured manner which made marking easy.
- (2) Some candidates demonstrated good knowledge of the subject matter.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) A few of the candidates lumped their answers on one page. They failed to start their answers on a fresh page.
- (2) Some candidates found it difficult to convey their ideas on paper. They could hardly express themselves meaningfully in the English Language.
- (3) Some candidates provided irrelevant material in their answers.
- (4) Some candidates demonstrated poor skills in sketching.

4. SUGGESTED REMEDIES

- (1) Candidates are advised to adhere strictly to the rubrics by answering each question on a fresh page. They should also not overlap their answers into the margins reserved for record of marks.
- (2) Candidates should improve on their vocabulary and grammar in the English Language by reading story books and magazines.
- (3) Candidates should understand the requirements of the questions before they attempt to answer them.

5. DETAILED COMMENTS

Question 1

- (a) **What is a model in designing?**
- (b) **Explain three methods of gathering information to solve a design problem.**

- (c) **State one use each of the following in soldering:**
- (i) **soldering iron;**
 - (ii) **flux;**
 - (iii) **file.**
- (d) **State one forging operation**

Candidates were able to answer the term *model* in designing.

(b) Part (b) posed no problem for the candidates as they explained the methods of gathering

information to solve a design problem. The methods include interview, observation, questionnaire, brainstorming and literature research.

Candidates could not provide suitable answers to the use of soldering iron, flux and file as required in (c). Candidates' answers to the use of the file was poor. Some stated that the file is used for filing but the required answer is that it is used to clean soldering iron and metal surfaces to be soldered.

Candidates performed better in the last part of the question.

Question 2

- (a) **State three potential dangers associated with the use of machines.**
- (b) **List three safety devices found on machines which make them safe for use.**
- (c) **List two machines which when being used would require the wearing of goggle.**
- (d) **State one purpose of cutting oil.**

Most of the candidates were attracted to this question and their responses were quite good.

- (a) Candidates' performance in this question was above average.
- (b) The safety devices found on machines which include guards, stop buttons, overload trippers, foot brakes and trip guards were given by candidates.
- (c) Candidates scored good marks in this question.
- (d) Candidates' performance in this question was also remarkable.

Question 3

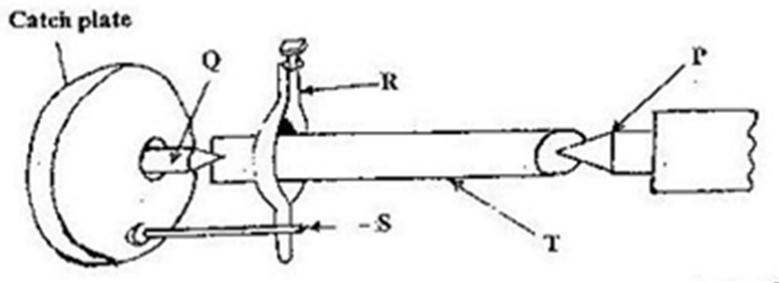
- (a) **What is sand casting?**
- (b) **State the use of each of the following tools:**
 - (i) **riddle;**
 - (ii) **strike-off bar;**
 - (iii) **draw spike;**
 - (iv) **gate cutter;**
 - (v) **sprue pins.**
- (c) **Sketch a bellow used in the foundry shop.**

Though a lot of candidates answered this question, performance was not encouraging.

- (a) Candidates could not come out well in their explanation of sand casting. It is the process of pouring molten metal into an already prepared mould and allowing to solidify to obtain a casting.
- (b) Candidates' performance in the uses of the tools associated with sand casting was just average. They got some correct and failed to produce tangible answers to the others.
- (c) Candidates demonstrated their inability to sketch as required in this question. Most of the sketches of a bellow produced by candidates were not good.

Question 4

The sketch below shows a catch plate in use when turning between centres.



- (a) Name the parts labelled P, Q, R, S and T.
 - (b) State the use of each of the following lathe accessories:
 - (i) mandrel;
 - (ii) collet.
 - (c) (i) Sketch a half-centre.
(ii) State its use on a centre lathe.
- (a) Candidates were able to name the parts indicated in the sketch except that some of them interchanged the driving dog/carrier and driving pin.
 - (b) Candidates stated correctly the lathe accessories.
 - (c) Candidates' sketching skills were brought to question as they provided poor sketches of a half-centre.

Question 5

- (a) (i) State the difference between a tap and a die.
(ii) State the use of a die nut.
- (b) With the aid of a sketch, describe how the hand tool is used in cutting external thread on the bench.
- (c) With the aid of a sketch, show a micrometer reading of 12.75 mm.

Though the majority of candidates attempted this question, their responses were not encouraging.

Some candidates could not come out clearly in their explanation of the difference between a tap and a die.

A tap is used to cut internal thread whilst a die is used to cut external thread. However, a die nut is used for rectifying or correcting an already damaged thread.

Most of the candidates could not describe with a sketch how the hand tool is used in cutting external thread on the bench.

(c) Some candidates were able to produce sketches of a micrometer reading of 12.75 mm.

TECHNICAL DRAWING 1

1. GENERAL COMMENTS

The standard of the paper is comparable to that of the previous year. Generally, candidates' performance was average.

2. A SUMMARY OF CANDIDATES' STRENGTHS

Among the commendable features in the answers of candidates were:

- (1) Neat and accurate isometric projections and good pencil work. Dimensions were also within tolerance.
- (2) Candidates had good understanding of how to interpret the isometric block into its orthographic projections.
- (3) The quality of the outlines was clearly differentiated from constructional lines.
- (4) The vertex position for the construction of the parabola was correctly done using the division of line method.
- (5) The moulding pieces were correctly drawn with the ground auxiliary line at its correct position.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) The majority of candidates did not revise the basic geometrical construction on plane figures.
- (2) Candidates lacked good understanding in placing the various views of given isometric blocks.
- (3) Candidates could not determine the action and reaction supports of a simply supported beam.
- (4) Most of the candidates drew true shapes without auxiliary projections.

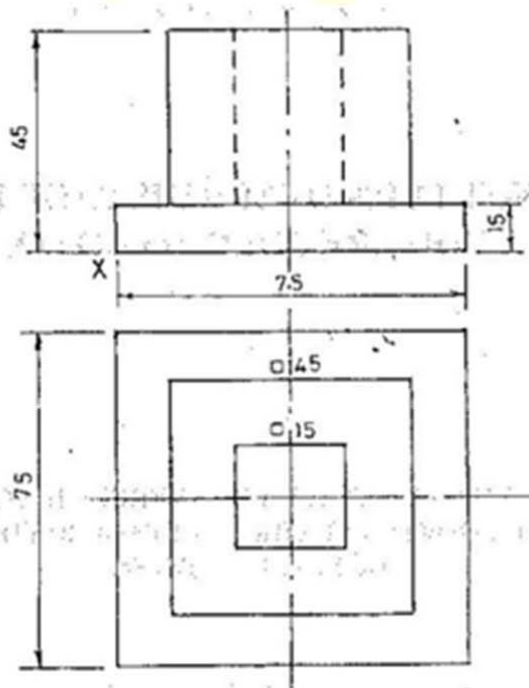
4. SUGGESTED REMEDIES

- (1) Candidates should ensure that they revise the topics in the entire syllabus and not to limit their revision to the final year topics only.
- (2) Construction of loci must be treated very well with emphasis on their eccentricities.
- (3) Candidates should know how to apply the construction and conversions of plane figures.
- (4) It should be emphasized that, *Bow's Notation* is used to determine the polygon of forces for internal forces of any type of simply supported beam.

5. **DETAILED COMMENTS**

Question 1

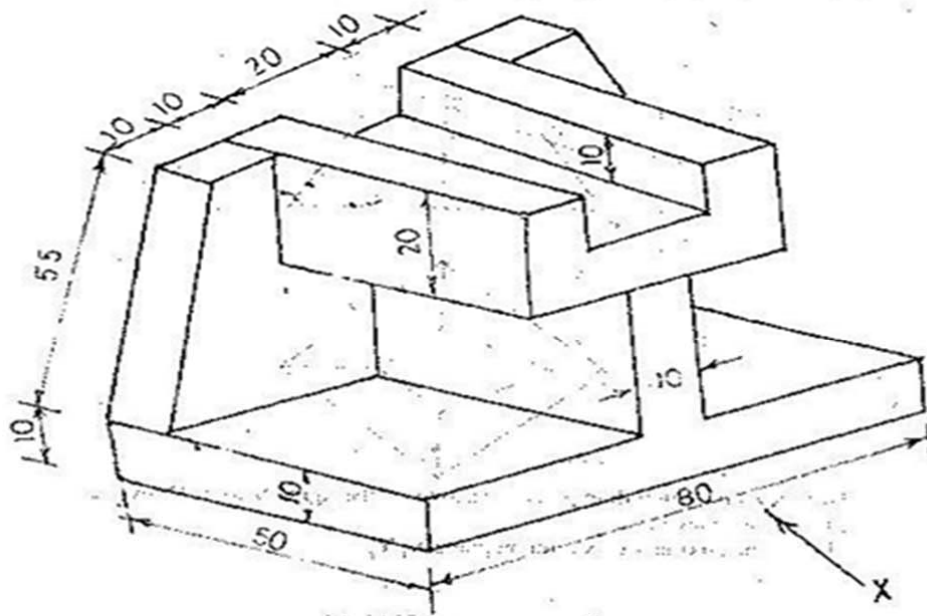
- (a) The perimeter of an isosceles triangle PQR is 120 long and its vertical height is 50. Construct the triangle.
- (b) Two views of a block are shown in first angle projection below. Draw the isometric view of the block. (Make point X the lowest).



- (a) The majority of candidates drew the perimeter, bisected and projected the altitude, but could not continue further. The construction involved the conversion of the given perimeter into three sides using the given altitude and the base length.
- (b) Most of the candidates did very well by interpreting the orthographic projection into isometric views. Candidates' linework was neat and drawing within tolerance. A few candidates were unable to indicate the inner edge of the square slot. The performance of candidates was slightly above average.

Question 2

- (a) The figure below shows a bracket. Draw, full size, in first angle projection, the following views:
- (i) front elevation in the direction of arrow X;
 - (ii) plan;
 - (iii) left end elevation.



(b) Construct a parabola whose focus is 40 from the directrix, and its depth from the focus is 100.

(a) Many candidates were able to construct the isometric block into orthographic projections satisfactorily. Few candidates could not construct the correct left elevation.

Candidates could not indicate the hidden details in both the end elevation and the plan.

(b) The majority of candidates could not indicate the depth of the parabola. Few of them had the axis of the parabola very short and vice versa, i.e few vertical lines were constructed between the vertex and the end of the depth. Few candidates could also not indicate the correct points of the locus on each of the vertical lines drawn.

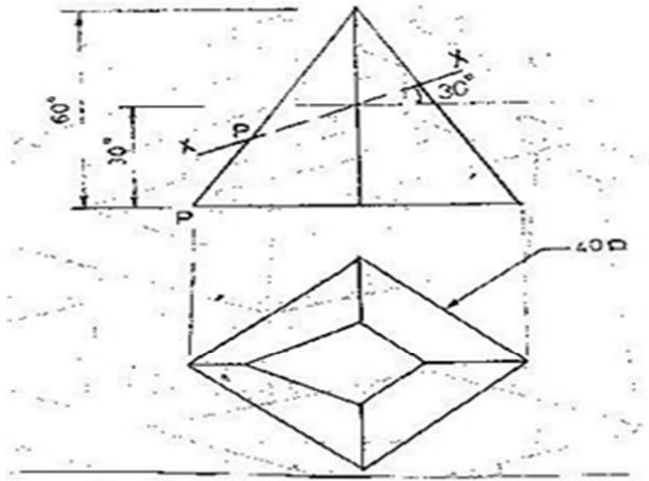
Question 3

The figure below shows the front elevation and an incomplete plan of a truncated square pyramid.

(a) Copy the given views;

(b) Complete the plan;

(c) Construct the surface development (without the base), using P-P as the seam.



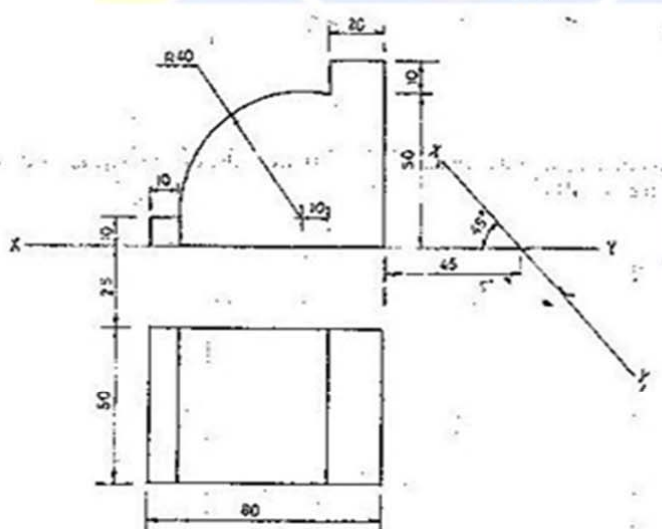
Few candidates were able to construct the required square on the plan. Candidates failed to firm the outlines of the object, i.e the cut surface and the middle edge on the elevation.

Most of the candidates had the problem of locating the points for the cut surface on the vertical diagonal of the plan. Few candidates hatched the cut surface, while others used the seam P-P as the required and develop from the longer side.

The performance of candidates was generally good.

Question 4

- (a) Two views of a moulding piece are shown in the figure below. Draw the
 (i) two views;
 (ii) the auxiliary elevation on plane X_1Y_1 .

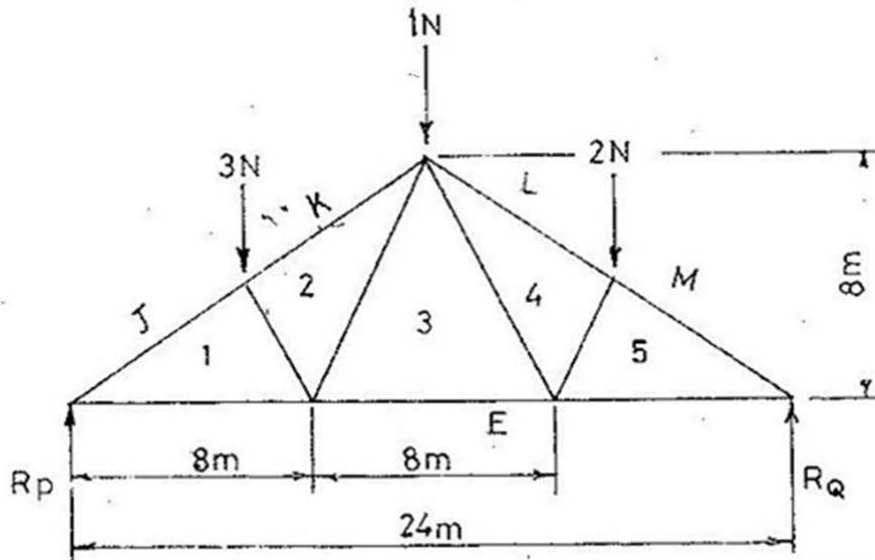


Many of the candidates could not construct the auxiliary projection. The front elevation and the plan were correctly copied but they did not attempt the auxiliary projection. Candidates should have projected perpendicular lines from the plan on the ground line X_1Y_1 , but this was not done.

Candidates who attempted this question produced very poor projections. Candidates' performance was below average.

Question 5

The figure below shows a three-bay roof truss of span 24 m and height 8 m. It carries three unequal vertical loads.



Few candidates used the wrong scale for the construction of the space diagram. Candidates failed to label the spaces with the given Bow notation. Those who attempted it neglected the letter 'E' between the reactions R_Q and R_p .

The majority of candidates produced poor force lines. The funicular polygon constructed was poor, i.e. transferring the close line to the force line to obtain the values for the reactions was not done.

Most of the candidates also did not construct parallel lines from the force line to each member of the truss to enable them determine the magnitude and the nature of forces in the members.

Few candidates used analytical method to determine the reactions at R_p and R_Q . Performance of candidates was poor.

TECHNICAL DRAWING 2

1. GENERAL COMMENTS

The standard of the paper in terms of subject content, level of difficulty and rubrics are similar to those of the previous years.

The performance of candidates was at par with the previous year's. It has always been the case over the years, that candidates perform better in the building option than in the mechanical option.

2. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) Draughtmanship skills of most of the candidates were commendable.
- (2) Most candidates exhibited a high level of understanding of the basic principles underlying free hand sketching.
- (3) Candidates were able to draw to conform with the British Standard (BS 308)
- (4) Many candidates drew to the scale required.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Identification of basic hand tools has been a problem for most of the candidates.
- (2) Many candidates who attempted the mechanical option could not assemble the given components correctly.
- (3) Most candidates did not use the correct symbols for the building options, i.e. doors, walls and footings
- (4) Most candidates produced poor pencil work.

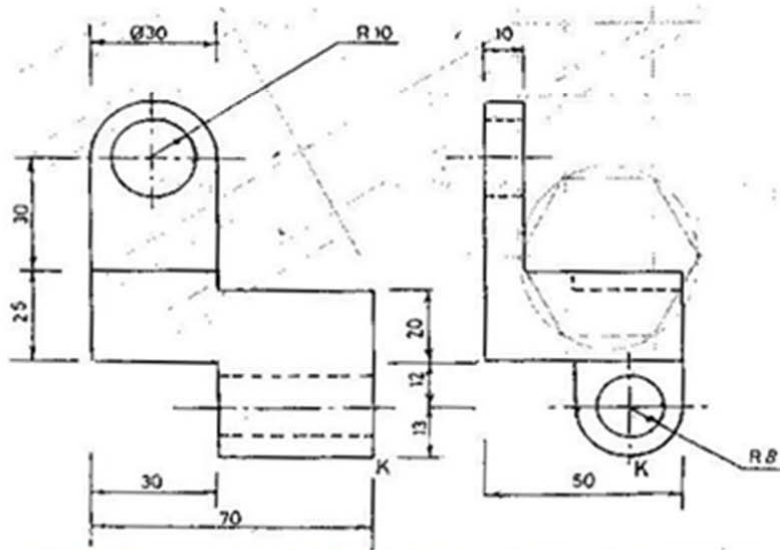
4. SUGGESTED REMEDIES

- (1) Teachers and students should make occasional visits to the industries to see at firsthand basic machine tools.
- (2) Teachers should employ other teaching aids like charts and models to bring a better understanding of the topics to their students.
- (3) Students should be encouraged to practise freehand sketching of hand tools.
- (4) More emphasis should be placed on assembling and sectioning of machine parts.

5. DETAILED COMMENTS

Question 1

Two views of a block are shown below. Sketch approximately full size, the isometric view of the block making K the lowest point.



Few candidates were able to answer this question correctly. The majority of candidates who attempted it used straight edges as an aid to draw the block in isometric instead of free hand.

The majority of candidates were able to understand the fact that the circle on the elevation was a through hole and represented it as such; but could not do same for the base hole.

Candidates who drew the block correctly represented K as the lowest point. Candidates' performance was fair.

Question 2

Make a neat freehand sketch of a pair of pincers.

The majority of candidates produced very good sketches of a pair of pincers. However, a few candidates were not able to identify the tool and sketched tongs and pliers, while others sketched in two dimension instead of pictorial sketch.

Performance of candidates was very good.

Question 3

Make a neat freehand pictorial sketch of an adjustable spanner.

Very few candidates attempted this question and produced a pictorial sketch as a correct response. Others drew a double-ended flat spanner.

Performance of candidates was very poor.

Question 4

Candidates were given a sketch plan of a twin three-bedroom bungalow and were expected to draw the floor plan, left side elevation and a detailed sectional elevation to a scale of 1:100 and 1:50 respectively.

The majority of candidates produced very good working drawings with good draughtsmanship skills.

Few candidates could not use the correct symbols to represent the 7 details of the floor plan.

Candidates showed good pencil work.

Candidates' performance was very good.

Question 5

A sub-assembly of a cast lever bracket was given, two views of a cast lever bracket clamped by a bolt passing through a 38 mm diameter hole and screwed into the M36 threaded hole. The bolt is hexagonal headed and 124 mm long.

Candidates were required to study the two views and draw half full size, in third angle projection the given plan, a sectional front view on a specified plane and a sectional end elevation.

Most of the candidates could not use the correct scale specified but drew full size.

Many candidates could not hatch and section correctly the adjacent component parts.

Candidates copied the given plan without the bolt in place. This brought disparities in their responses.

Generally, candidates' performance was average.

WOODWORK 1

1. GENERAL COMMENTS

The standard of the paper was within the ability of the candidates and compared favourably with that of the previous years. The performance of the candidates was satisfactory.

2. A SUMMARY OF CANDIDATES' STRENGTHS

A few of the candidates interpreted the working drawing correctly, marked out accurately and produced excellent work.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Most candidates used blunt cutting tools.
- (2) Candidates could not measure accurately and cutting was not neatly done.
- (3) Some candidates could not manage their time well and thus produced incomplete work.

4. SUGGESTED REMEDIES

- (1) Teachers should ensure that cutting tools are well sharpened before use.
- (2) Teachers should give practical exercises to candidates and encourage them to work within the given time.
- (3) Candidates should be guided to take accurate measurements and how to cut neatly.

5. DETAILED COMMENTS

A working drawing of a model of stationery holder was given to the candidates. They were requested to read, interpret the drawing and construct the holder.

The work involved the following:

- (1) **Through dovetail joint;**
- (2) **Pinning joints;**
- (3) **Stopped housing joints;**
- (4) **Bevelling;**
- (5) **Assembling.**

(1) THROUGH DOVETAIL JOINT

The construction of the through dovetail joints was attempted by most of the candidates. However, only a fraction of them read and interpreted the drawing correctly. A few of them however marked out accurately and produced excellent work.

Some of the candidates were unable to mark-out and cut the tails of the joints accurately. They made the pitches or slopes of the dovetails too acute. With too much taper on the tails, the roots of their tails became weak and some of them got broken. The corners of some of the tails also crumbled and broke away. A few of the candidates failed to trace the tails on the corresponding piece of timber accurately. As a result of that, then shape of the sockets could not conform to that of the tails and therefore poor work was produced.

The removal of the waste wood from the sockets was poorly done by some of the candidates. This was due to the use of blunt chisels.

Candidates should note that to produce a dovetail joint of maximum strength, the amount of the taper on it should be in the ratio of 1:6 to 1:8.

(2) PINNING JOINTS

Most of the candidates constructed the pinning joints. Well fitted joints were produced by a small percentage of them. The marking-out was accurately done by a greater number of them. The pins of the joints were neatly cut but the sockets were poorly executed.

Some of the candidates chopped out the waste wood from the socket through one side of the workpiece. This resulted in the edges of the sockets on the other side getting splinted.

The correct methods of chopping out waste wood from a socket are:

- (a) support the underside of the workpiece with a waste wood and chop out the waste wood from the socket through from one side;
- (b) chop out the waste wood from the sockets, working halfway through from

both

sides.

(3) STOPPED HOUSING JOINTS

Most of the candidates had difficulty in interpreting the drawing of the stopped housing joints. The drawing showed stopped trenches but the candidates constructed through trenches.

(4) BEVELLING

Most of the candidates cut the bevel. Most of them either did not measure accurately before cutting or could not cut accurately to the marked lines.

(5) ASSEMBLING

About half the number of candidates managed to assemble their work. A few of them were able to dress their work.

WOODWORK 2

1. GENERAL COMMENTS

The standard of the paper measured up to the demands of the syllabus and compares favourably with that of the previous year. The performance of the candidates was the same as that of the previous year's.

2. A SUMMARY OF CANDIDATES' STRENGTHS

A few of the candidates exhibited some commendable features in the following areas:

- (1) freehand pictorial sketches;
- (2) orthographic drawings in first angle projections, i.e. front elevation and sectional end elevation;
- (3) pencil work was good.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

Some of the candidates showed weaknesses in the following areas:

- (1) lack of skills to use pencil only for the freehand pictorial sketches;
- (2) inability to interpret the given scale of 1:5;
- (3) failure to show the cutting plane on the front elevation;
- (4) failure to dimension both the freehand pictorial sketches and orthographic drawings;
- (5) inability to provide the necessary features of the cabinet such as: hinges, locks, handle(s) and stand;
- (6) lack of knowledge in framed carcass construction;
- (7) poor draughtmanship.

4. SUGGESTED REMEDIES

Candidates must endeavour to go through adequate exercises on relevant topics to enable them acquire the required skills to improve upon their performance.

5. DETAILED COMMENTS

Design a cabinet to meet the following specifications:

- Width** - 750
Depth - 300
Height - 900, including the stand

The cabinet is a framed carcass construction with plywood covering on the outside. The cabinet has one shelf. The upper division is open, while the lower

division is lockable with two hinged doors 450 mm high. The shelf and doors are made with 18 mm veneered plywood.

1. **Make two preliminary freehand pictorial sketches of different designs of the cabinet.**
2. **Select one of the sketches in Question 1 and to a scale of 1:5, draw in the First Angle Orthographic projection the following:**
 - (a) **the front elevation;**
 - (b) **a sectional end elevation.**
3. **Draw an enlarged detail of one corner of the cabinet.**

(1) PRELIMINARY FREEHAND PICTORIAL SKETCHES

A few of the candidates presented designs that satisfied the requirements of the given specifications. Some of them however provided three designs instead of the two demanded. The majority of candidates produced the sketches with the aid of drawing instruments. Candidates are advised to desist from using instruments to produce their design sketches when they are required to draw in freehand.

(2) FRONT ELEVATION

All the candidates attempted this question. Some of them, however, failed to realize that the cabinet required should have a framed carcass with plywood covering on the outside, one shelf, open division, two lockable hinged doors and a stand. The majority of drawings presented omitted some of the features mentioned earlier.

In some cases, the following were omitted completely:

- (a) shelf for the cabinet;
- (b) pulls/handles for the doors;
- (c) hinges;
- (d) lock(s);
- (e) cutting plane;
- (f) overall dimensions;
- (g) naming/labelling the views.

A few of the candidates however produced good drawings.

(3) SECTIONAL END ELEVATION

This view was poorly drawn by the majority of candidates. In most cases, the sections of the following members were either omitted completely or not shown by the candidates:

- (a) stiles of the top and bottom frames of the cabinet;
- (b) rails in elevation of top, bottom and side frames of the cabinet;
- (c) plywood covering of the top frame;
- (d) plywood covering of the bottom frame;
- (e) shelf (18 mm plywood);
- (f) doors (18 mm plywood);

- (g) stand;
- (h) back covering;
- (i) naming/labelling the view.

Candidates are encouraged to take note and do a lot of practice exercises on this aspect of the drawing.

(4) ENLARGED DETAIL OF ONE CORNER OF THE CABINET

All the candidates failed to locate or indicate a particular corner of the cabinet. Due to their lack of knowledge in a framed carcass construction, most of the candidates rather chose the solid carcass construction instead of the cabinet.

A few of them however, presented their details using the simple framed carcass without the plywood covering.

Candidates should be engaged on more class exercises in detail drawings to overcome this weakness.

(5) DRAUGHTSMANSHIP

(a) Border Lines

The majority of candidates failed to draw border lines. It is an indication that candidates had little knowledge in basic principle of design and drawing.

(b) Title Block

Most of the candidates did not provide the title block on the drawing paper. Candidates must be taught to provide this and fill in the appropriate information.
For example, name, title of drawing, scale and date.

(c) Layout

This aspect was satisfactorily done by all candidates but many failed to indicate the direction of view for the correct position of the sectional elevation in its appropriate plane.

(d) Neatness

Candidates should use clean drawing instruments and recommended pencils and also avoid over-shading of preliminary sketches.

WOODWORK 3

1. GENERAL COMMENTS

The paper was within the level of candidates and the standard was not different from that of the previous years. The questions cut across the syllabus and the general performance of candidates was reasonably good.

2. A SUMMARY OF CANDIDATES' STRENGTHS

- (1) Candidates answered the required number of questions which meant that they covered most of the topics in the syllabus before the examination.
- (2) Candidates exhibited good practical skills on the surface planing machine by coming out with smooth workpieces.
- (3) Candidates selected the appropriate upholstery tools and materials to give them good completed work.
- (4) Candidates did good sketches of a hinge and joints.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

Most candidates were very poor in sketching the mitre block. Many candidates could not state the market sizes of timber and steps in finishing glass-prepared pieces of timber.

4. SUGGESTED REMEDIES

- (1) Candidates are advised to do more freehand sketching to improve on their sketches.
- (2) School authorities are advised to make copies of previous Chief Examiners' Reports available to teachers and candidates so that candidates do not commit mistakes highlighted in previous reports.

5. DETAILED COMMENTS

Question 1

- (a)
 - (i) **State four operations that are carried out on the surface planing machine.**
 - (ii) **In which operation on the surface planing machine is the bridge guard detached?**

- (b) **State one specific use of each of the following:**
 - (i) **mallet;**
 - (ii) **mitre square;**
 - (iii) **veneer hammer;**
 - (iv) **sliding bevel.**

- (c) **Explain the term kerf bending.**
- (d) **Make a pictorial sketch of a mitre block.**
- (a) (i) Satisfactory answers were given to this question.
(ii) Most candidates did not attempt this question. Those who attempted it got it wrong. The operation is rebating.
- (b) Most of the candidates answered the question well.
- (c) Candidates wrote about kerf and left out the bending to it. It refers to the process of cutting a piece of solid wood on the inside surface with series of saw cuts and bending them over pegs to form a desired shape or curve.
- (d) A greater number of candidates who attempted this question had it wrong. Students should be encouraged to practise the sketching of tools and equipment.

Question 2

- (a) **Name four of each of the following:**
(i) **upholstery tools;**
(ii) **upholstery materials.**
Figure 8 shows the sketch of a hand tool.

Use it to answer Questions 2 (b)(i) to

2(b)(iii).

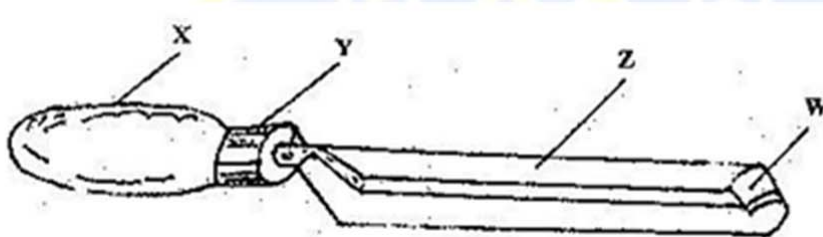


Figure 8

- (b) (i) **Name the tool shown.**
(ii) **Name the parts labelled W, X, Y and Z.**
(iii) **State one specific use of the tool.**
- (c) **State four market sizes of timber.**

The (a)(i&ii) part of the question was well-answered. However, a few of the candidates interchanged the answers for the tools and materials.

For part (b), candidates could not identify the tool. The tool is a firmer or a carving gouge.

Most candidates however were able to label the parts correctly. They could not state the use of the tool. It is used for grooving, fluting, general carving or cleaning convex curves.

Instead of giving the sizes, most candidates gave the names of the sizes for part (c).

Question 3

- (a) (i) **Sketch a hinge.**
(ii) **Label three parts of a the hinge sketched in (a)(i).**
- (b) **State two uses of each of the following:**
(i) **particle board;**
(ii) **hardboard.**
- (c) **State two physical characteristics of iroko.**
- (b) A clue was given in the question that the timber had already been glass papered yet some candidates started with the preparation of timber. A good craftsman only needs to apply sanding sealer, rub down, apply first coat of lacquer, rub down again and apply final coat.

