

TECHNICAL SUBJECTS

RÉSUMÉ OF TECHNICAL SUBJECTS

1. STANDARD OF THE PAPER

All the Chief Examiners of the Technical subjects were of the view that the standard of the papers were comparable to that of the previous years.

2. PERFORMANCE OF CANDIDATES

The performance of candidates varied for the different papers under the Technical program. Candidates' performance in ICT 2, Electronics 2 and Metalwork 2 declined as compared to that of last year.

Performance in Building Construction 2 and 3, Metalwork 3 and Auto Mechanics 3 compared better with that of the previous year. According to the Chief Examiners of Woodwork 2 and 3, Technical Drawing 2 and 3, Applied Electricity 2 and 3, candidates' performance was better than last year's.

3. SUMMARY OF CANDIDATES' STRENGTHS

(1) ORDERLY PRESENTATION OF ANSWERS

Some candidates, according to the Chief Examiners, had their work well numbered and evenly spaced out for easy reading. This was reported in Building Construction 2 and Auto Mechanics 2.

(2) IN-DEPTH KNOWLEDGE OF SUBJECT MATTER

Some candidates showed very good instrument reading in their experiments in Electronics 3 and Applied Electricity 3. In Technical Drawing 3, most candidates demonstrated good knowledge and skills in First Angle Orthographic Projection and sectioning. Interpretation of the working drawing for the artefact to be produced was well done by many candidates as reported in Metalwork 3 and Woodwork 3. In Electronics 2, candidates demonstrated their knowledge in electromagnetism by stating some devices that use the principle of electromagnetism in their operation. Most candidates of ICT 2 and 3 demonstrated good knowledge in number system computing and HTML respectively.

(3) PRODUCTION OF GOOD SKETCHES

Candidates in Building Construction 3 produced proportional and accurate sketches to answer questions that demanded sketches. In Technical Drawing 2, most candidates used neat and perfect lines to produce their drawings.

4. **SUMMARY OF CANDIDATES' WEAKNESSES**

(1) **INADEQUATE PREPARATION**

In Metalwork 3, most candidates did not attempt the machining test due to their lack of knowledge and skills in lathe machining. In Applied Electricity 2 candidates showed lack of knowledge in electrical installation works. In Electronics 2 and ICT 2, candidates had difficulty in answering the questions.

(2) **LACK OF IN-DEPTH KNOWLEDGE OF SUBJECT MATTER**

A significant number of candidates failed to state the given scale, show the cutting plane on the front elevation, indicate the dimensions and name the views drawn in Woodwork 2. In Woodwork 3, most candidates were unable to work to the required dimensions. Most candidates in Technical Drawing 3 showed lack of skills in freehand sketching. In ICT 3, candidates could not provide a formula to solve the database question.

(3) **NON-ADHERENCE TO RUBRICS OF EXAMINATION**

A few candidates in Building Construction 3 either did not read or refused to observe the instruction on the number of questions to answer and as such answered more questions than was required. In Electronics 3, a few candidates provided irrelevant information such as copying circuit and pictorial diagrams which were not demanded by the question. In Technical Drawing 2, a few candidates partly answered all the five questions instead of answering only three. Candidates in Auto Mechanics 2 did not start questions on fresh pages but rather mixed their responses up.

(4) **POOR EXPRESSIONS**

Expressing ideas in English Language was poor in Building Construction 2 and 3 and Auto Mechanics 2 which made comprehension of what some candidates had written difficult. In Elective ICT 2, a few candidates had very bad handwriting which made reading very difficult.

5. **SUGGESTED REMEDIES FOR THE WEAKNESSES**

The following were suggested as remedies for the weaknesses:

- (1) Practical work should be intensified by instructors.
- (2) Candidates should be impressed upon to read and follow the rubrics of the papers.
- (3) Teachers should have all the necessary tools and equipment and instruments including appropriate textbooks for the training of students.
- (4) Candidates should read over their answers to enable them correct errors such as omissions and poor spellings.
- (5) Candidates should be encouraged/taught to answer questions systematically.

APPLIED ELECTRICITY 2

1. GENERAL COMMENTS

The standard of the paper was comparable to that of the previous years.

Candidates' performance was an improvement over the previous year.

2. SUMMARY OF CANDIDATES' STRENGTHS

Candidates' strengths were noted in these areas:

- (1) Definition of an insulator and stating properties of a good insulator;
- (2) Drawing a circuit diagram illustrating a PN junction diode connected in a reverse biased mode;
- (3) Stating applications of a PN junction diode.

3. SUMMARY OF CANDIDATES' WEAKNESSES

Candidates showed lack of in-depth knowledge in the following areas:

- (1) Drawing layout diagrams of radial and ring wiring systems;
- (2) Drawing and labelling the input-output (I-V) characteristics of a PN junction diode;
- (3) Calculating the feedback ratio and loop gain of a non-inverting operational amplifier (op-amp);
- (4) Application of Ohm's law to solve basic electrical problems.

4. SUGGESTED REMEDIES

- (1) Teachers should effectively teach students the techniques in responding to rubrics.
- (2) Teachers should endeavour to complete the syllabus to adequately prepare candidates for the examination.
- (3) Efforts must be made to take students on visits to industries, power stations, radio and television stations.

5. DETAILED COMMENTS

QUESTION 1

- (a) (i) Define insulator.
(ii) State two properties of a good insulator.
- (b)

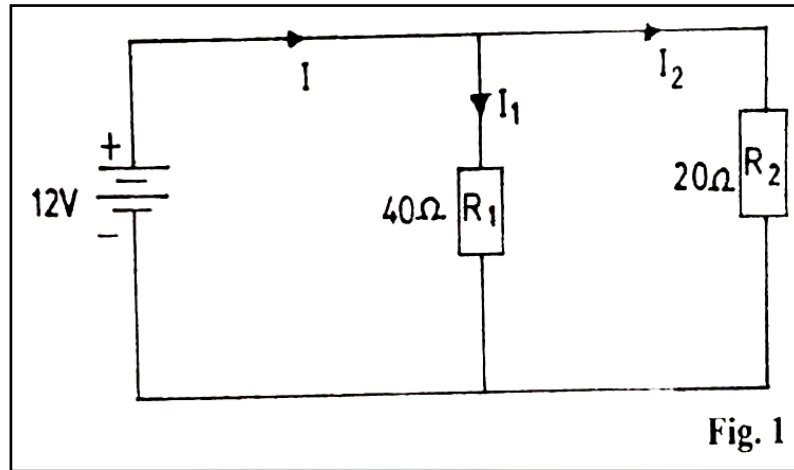


Fig. 1 is a circuit diagram. Using the diagram, calculate the:

- (i) current (I_1) flowing through resistor R_1 ;
(ii) current (I) flowing through the circuit.

- (a) A very popular and well answered question by majority of the candidates.
(b) A few candidates could not apply Ohm's law or Kirchhoff's law to the network in Figure 1 to obtain the required values of current.

QUESTION 2

A coil of 8Ω resistance draws a current of $12.25A$ when connected across a $240V$, $50Hz$ a.c. supply. Calculate the:

- (a) impedance of the circuit;
(b) inductive reactance;
(c) inductance of the coil.

A popular and fairly answered question. Some candidates could not arrive at the correct answers for the impedance (Z), inductive reactance (X_L) and inductance (L) of the coil even though they quoted the correct formulae as follows;

$$(Z) = \frac{V}{I} \quad , \quad X_L = \sqrt{Z^2 - R^2} \quad \text{and}$$
$$L = \frac{X_L}{2\pi f} \quad ; \quad \text{since } X_L = 2\pi fL$$

QUESTION 3

Draw layout diagrams of radial and ring wiring systems using four 13 A socket outlets, a fuse and an a.c. supply.

A poorly answered question.

The majority of the candidates could not draw layout diagrams of radial and ring wiring systems as expected.

The instruction to use four socket outlets was also not adhered to.

QUESTION 4

- (a) Explain two methods of exciting a.c. generators.**
- (b) Calculate the frequency of the e.m.f. produced by an a.c. generator having 4 poles rotating at a speed of 3600 revolutions per minute.**

- (a) The majority of the candidates stated the two methods of exciting a.c. generators but failed to explain the methods as demanded by the question.

Candidates were expected to answer as follows:

- Self - Excited A.C. Generator: - The magnetic field of the main poles is excited by a current supplied to the windings of the main poles from the armature winding.
- Separately Excited A.C. Generator: -The magnetic field of the main poles is excited by a current supplied to the windings of the main poles from an external source.

QUESTION 5

- (a) Draw and label the input-output (I – V) characteristics of a PN junction diode.**
- (b) Draw the circuit diagram to illustrate a PN junction diode connected in a reverse biased mode.**
- (c) State three applications of a PN junction diode.**

- (a) Sketching and labelling the (I-V) characteristics of a PN junction diode was poorly executed by majority of the candidates.
- (b) The majority of the candidates answered this question very well.
- (c) Most of the candidates stated the applications of the PN junction diode without any difficulty.

QUESTION 6

(a) State three methods of electron emission.

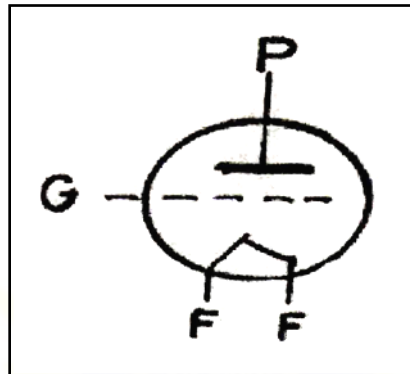
(b) (i) Draw and label a triode valve.

(ii) State the function of each electrode labelled in (b)(i).

(a) This was generally well answered.

(b) (i) The response to this question was very poor.

A well labelled diagram of a triode valve is shown below.



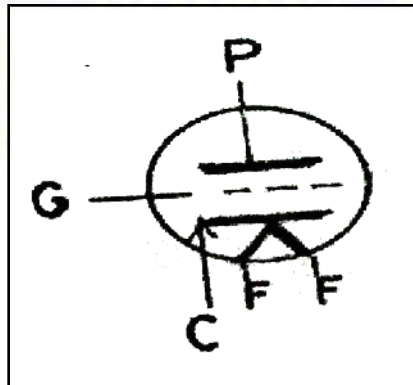
Filament serving as cathode

P - Anode/Plate

F- Filament/Cathode

G - Grid

Or



Triode with separated cathode and filament

(ii) The function of the electrodes as labelled in (b)(i) is given as

- Cathode: releases the electrons;
- Anode: attracts the electrons;
- Grid: controls the electrons emitted from the cathode.

QUESTION 7

- (a) Explain the term Noise as it relates to amplifiers.
- (b) A non-inverting operational amplifier (op – amp) has $R_i = 1 \text{ k}\Omega$, $R_f = 99 \text{ k}\Omega$ and open loop gain $A = 500,000$. Calculate
- feedback ratio (β);
 - loop gain.
- (c) State the formula for computing:
- voltage gain;
 - current gain;
 - power gain in amplifiers.

A very unpopular question.

- (a) The few candidates who attempted question seven managed to explain the term Noise as applied to amplifiers quite satisfactorily.
- (b) The majority of the candidates could not quote the formulae well to arrive at the correct answers even though all relevant parameters had been given.

The formulae for calculating the feedback ration (β) = $\frac{R_i}{R_i + R_f}$ and

The loop gain = βA

- (c) A considerable number of candidates provided good responses to this question.

APPLIED ELECTRICITY 3

1. GENERAL COMMENTS

The standard of the paper compared favourably to that of the previous years. Candidates' performance was generally satisfactory.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) The majority of the candidates understood the two experiments and were able to connect the circuit diagram.
- (2) Most of the candidates plotted good graphs.
- (3) Candidates used good scales in plotting their graphs.

3. SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Candidates wasted time by copying the circuit diagrams.
- (2) Some candidates could not determine the slope of the graph.

1. SUGGESTED REMEDIES

- (1) Teachers should adequately cover the teaching syllabus.
- (2) Laboratories should be well equipped to enhance effective teaching and learning.
- (3) Teachers should give more practical exercises to candidates to improve upon their skills.

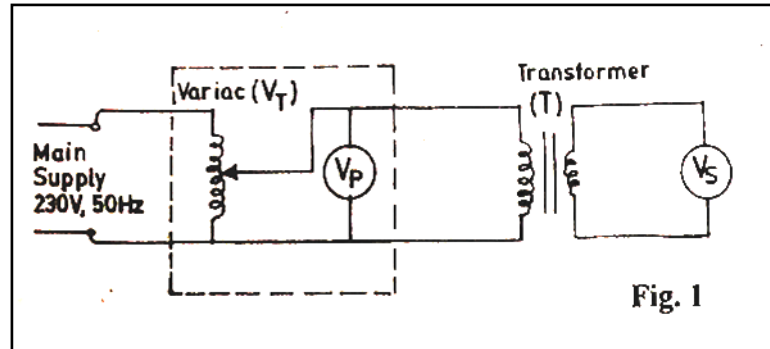
1. DETAILED COMMENTS

Candidates were provided with the following apparatus:

One digital multimeter;
One variac (0-230V);
One 230V/12V transformer;
One voltmeter (0-40V);
One voltmeter (0-230V);
One rheostat, 11.5 Ω , 5A;
One ammeter (0-6000mA);
One ammeter (0-600mA);
Two single-pole switches;
Connecting wires;
A set of hand tools.

QUESTION 1

Aim: To determine the turns ratio of a single-phase transformer.



- Connect the circuit as shown in Fig. 1.
- Ask the supervisor to check the circuit connection.
- Copy Table 1 into your answer booklet.

Table 1

V_p (V)	0	10	20	30	40	50	60	70
V_s (V)								

- Set the variac (V_T) to 0V.
- Connect the variac to the main supply and switch on.
- Read and record the voltage value (V_s) in Table 1.
- Adjust the variac to read 10V on V_P and record the corresponding value of V_s .
- Repeat step (g) for the other values of V_P in Table 1.
- Plot a graph of V_p (V) on the vertical axis against V_s (V) on the horizontal axis.
- Determine the slope of the graph.
- From the slope of the graph in step (j) deduce the turns ratio of the transformer.

In experiment 1, candidates were to determine the turns ratio of a single-phase transformer.

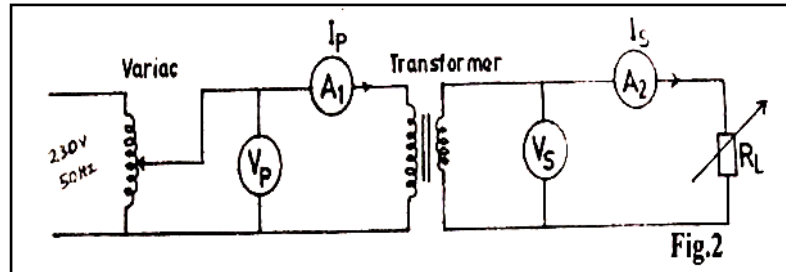
The majority of the candidates were able to connect the circuit diagram correctly.

Most of the candidates who attempted this question were able to determine the slope of the graph and deduced the turns ratio of the transformer.

Candidates' performance was fair.

QUESTION 2

Aim: To determine the current ratio of a transformer.



- Connect the circuit as shown in Fig. 2.
- Ask the supervisor to check the circuit connection.
- Copy Table 2 into your answer booklet.

Table 2

V_p (V)	I_p (A)	I_s (A)
200	0.1	
200	0.2	
200	0.3	
200	0.4	
200	0.5	
200	0.6	

- Set the variac to 0V.
- Connect the variac to the main supply and switch on.
- Using the multimeter, set the load (R_L) to its maximum.
- Adjust the variac to give 200V on V_p . Maintain this voltage throughout the experiment.
- Vary the load (R_L) to indicate the current (I_p) of 0.1A on ammeter (A_1).
- Read and record in Table 2 the corresponding value of I_s on ammeter (A_2).
- Repeat steps (h) and (i) for the other values of current (I_p) in Table 2.
- Plot a graph of current (I_s) on the vertical axis against current (I_p) on the horizontal axis.
- Determine the slope of the graph.
- State the current ratio of the transformer.

In experiment 2, candidates were required to determine the current ratio of a transformer.

The majority of the candidates were able to connect the circuit diagram as required.

The majority of the candidates plotted the graph by selecting very good scales.

Some of the candidates wrongly read the calibrations of the analogue meter.

Most of the candidates were able to calculate the slope of the graph and determine the current ratio of the transformer.

Candidates' performance was quite satisfactory.



AUTO MECHANICS 2

1. GENERAL COMMENTS

The standard of the paper was comparable to that of the previous years.

The performance of the candidates was the same as the previous years.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) Most candidates had a good comprehension of the items.
- (2) The arrangements and spacing of the answers in most cases were commendable, making scoring of the items easier.
- (3) Candidates had a great insight in the basic principles of machine engine torques.

3. SUMMARY OF CANDIDATES' WEAKNESSES

- (1) The candidates, in few cases, did not answer each question on a fresh page. Part of the answers for some questions were mixed up with others and it was quite difficult for the examiners to mark those scripts.
- (2) A few candidates also had literacy challenge. It was very difficult to understand whatever they had written.
- (3) Some candidates could not distinguish between fuel pump and oil pump.

4. SUGGESTED REMEDIES

The Auto Mechanics subject has both practical and theoretical components which require prospective candidates to learn hard and gain more insight into the subject.

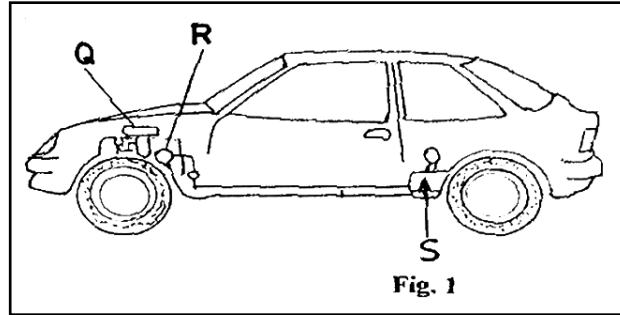
- (1) The candidates must ensure each question is answered on a fresh page and properly numbered.
- (2) Teachers must ensure that they complete the entire syllabus.
- (3) Teachers must provide appropriate textbooks with illustrated diagrams of parts of a motor vehicle to reinforce whatever they teach.

5. DETAILED COMMENTS

QUESTION 1

- (a) Name the appropriate tool used for:
 - (i) Tightening main bearing journal to specified torque;
 - (ii) Removing chain sprocket;
 - (iii) Removing broken spark plug.

- (b) The sketch in fig. 1 shows the fuel system of a petrol-engine vehicle.



- (i) Name the parts labelled Q, R and S.
- (ii) State the main function of each of the parts labelled R and S.
- (iii) What drive arrangement is most suitable for the automobile shown in the sketch?

- (a) Most of the candidates had no clue to the tools required for the following operations:
 - (i) Tightening of bearing journal - Torque Wrench
 - (ii) Removing chain sprocket - Sprocket extractor/puller
 - (iii) Removing broken spark plug - Tapered left-hand extractor
- (b)
 - (i) Q - Carburettor/Air cleaner
 - R - Fuel pump
 - S - Fuel tank

Greater number of candidates responded positively to the questions in this section.

- (ii) The main functions of the following;
 - R (pump) - It lifts fuel from fuel tank and supplies to the carburettor.
-It transfers fuel from the tank to the carburettor
 - S (tank) - It is a storage for fuel
- It contains the fuel used in the vehicle

The following were some of the wrong answers provided by the candidates:

- (i) The fuel pump transfers fuel from the carburettor
- (ii) The fuel pump distributes fuel to all parts of the engine that needs fuel for operation.
- (iii) The fuel pump lifts oil from gallery to the sump.
- (iv) It contains fuel which helps in lubrication.

The appropriate response for the type of drive of the car shown in the diagram are;

- (i) Front engine - front wheel drive
- (ii) Conventional drive
- (iii) Front engine-rear wheel drive

Candidates' performance was average.

QUESTION 2

- (a) (i) What is the difference between wheel and wheel rim?
(ii) What instrument is appropriate for checking tyre pressure?
- (b) List two types of:
(i) Wheel;
(ii) Wheel rim.
- (c) An automobile tyre has the mark 195/60/R15 written on its outer surface.
Explain, as applied to the mark, what the following indicate:
(i) 195;
(ii) 60;
(iii) R15.

(a) DIFFERENCE BETWEEN A WHEEL AND A WHEEL RIM

The response expected are:

- (i) The wheel is made up of a rim and a disc.

The wheel rim is the metallic part of a wheel on which the tyre is fitted.

- (ii) CHECKING TYRE PRESSURE:

- Tyre pressure gauge
- Tyre gauge

It was an easy item which candidates responded to positively.

Only few candidates had good marks from answering those questions.

(b) (i) TYPES OF WHEEL ARE

- Steel pressed/Disc wheel
- Wire or spoked
- Alloy Based wheel

TYPES OF WHEEL RIM ARE

- Safety rim/one-piece rim
- Two - piece rim
- Divided/split rim
- Semi-drop centre/Well rim

(c) TYRE MARKING 195/60/R15:

195: It indicates the sectional width of the tyre in mm

60: It indicates the sectional height (60% of the width)

R15: R means radial plytyre with a rim diameter of 15 inches

The wrong answers provided by a number of candidates were:

195: Width/Weight

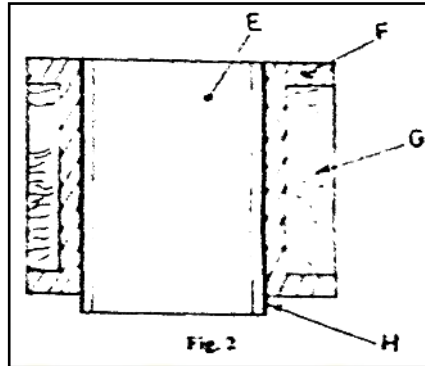
60: Height

R15: Radius 15 inches

Candidates' performance was average.

QUESTION 3

- (a) The sketch in Fig. 2 shows a dry liner used on automobile engine.



- (i) Explain why the liner is called dry liner.
(ii) Name the parts labelled E, F, G and H.
- (b) State three differences between dry liner and wet liner, as applied to automobile engines.
- (c) What is the main purpose for cooling automobile engines?
- (a) Most candidates responded positively and named the parts i.e.
E: Cylinder bore or engine bore
F: Cylinder block or Engine block
G: Water/Coolant
H: Cylinder liner or liner
- (b) The right responses provided by the candidates were;
- (i) The wet liner can be fitted and removed easily.
– The dry liner requires use of machines to both remove and refit.
- (ii) The wet liner has direct contact with the cooling water.
– The dry liner is not in direct contact with coolant.
- (iii) The wet liner has thicker wall.
– The dry liner has thin wall.

The candidates responded very well, but it was surprising that some candidates reversed the features of the dry liner and wet liner e.g. A wet liner has thin wall whilst the dry liner has a thick wall.

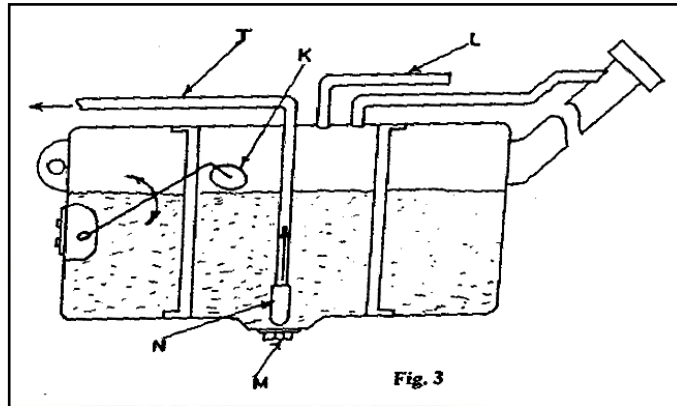
(c) THE MAIN PURPOSE OF COOLING ENGINES

The expected responses were:

- To remove excessive heat from the engine
- To prevent engine overheating
- It was a popular question and majority of the candidates' performance was average.

QUESTION 4

(a) The sketch in Fig. 3 shows a detailed view of an automobile fuel tank.



- (i) Name the parts labelled J, K, and N.
- (ii) State one reason each why the parts labelled L and M are installed on the tank.
- (b) (i) Where in automobile is fuel tank located if the engine is located at the front?
- (ii) Explain why the location the tank is as stated in 4(b)(i).
- (c) State two merits of electrical fuel pump.

(a) (i) Naming of labelled parts

The expected responses were

J: Outlet pipe/supply pie/feed pipe

K: Float

N: Fuel filter/fuel strainer

A greater number of the candidates had all the answers right while a few others were only familiar with N, the fuel filter/fuel strainer.

(ii) Reason why L and M are mounted on petrol tank.

L (VENT)

- It prevents the build up of excessive pressure when the fuel level rises.

- It allows atmospheric pressure to act on the fuel which assists easy flow to the engine.

M (DRAIN)

- It is used to drain fuel and any water collected in the tank
- It drains any impurities that may collect in the tank.

Most candidates had no difficulty with the question.

(b) (i) LOCATION OF PETROL TANK

- At the rear
- Under the back seat

(ii) – To prevent fire risk

- To prevent explosion
- To prevent vapour lock

The candidates provided the correct answers.

(c) Two merits of electrical fuel pump:

- It is easier to install
- It operates as soon as engine is switched on
- It is cheaper to maintain
- It has longer life span

That question was well answered. Candidates' performance was good.

QUESTION 5

(a) Sketch a coil-ignition system for a four-cylinder petrol engine and label the following parts: ignition coil, distributor and contact breaker.

(b) State one function each of the following electronic devices:

- (i) Diode;**
- (ii) Transistor.**

(c) State one use of a hydrometer in auto mechanics workshop.

(a) The candidates sketched various ignition circuits and labelled the three essential components e.g., ignition coil, distributor and contact breaker.

Some of the candidates however wrongly labelled components in the ignition circuit. For example;

- (i) The high-tension cable of the distributor was labelled as ignition coil
- (ii) Another candidate also referred to the distributor as throttle.
- (iii) In another development, earthed cable of the battery was labelled as diode.

(b) (i) Function of Diode:

- It is an electrical device that allows current to flow in just one direction.
- It is a device that prevents current to flow in the reverse direction.
- It converts alternating current to direct current.

The majority of candidates provided answers close to those stated above to the questions.

(ii) Function of Transistor

- The transistor is a semi-conductor device used for switching on and off current in a circuit.
- It is a device that enables a large current to be controlled (switched on and off) by a small current.
- It is used to amplify electronic signals and power

A good number of candidates provided satisfactory answers.

(c) The purpose of hydrometer:

- It is used for checking the specific gravity of electrolyte.
- It is used for measuring the relative density of electrolyte.

Candidates' performance was average.

AUTO MECHANICS 3

1. GENERAL COMMENTS

The standard of the paper was comparable to that of the previous year.

The general performance of the candidates was above average and compared to that of previous year.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) The majority of the candidates answered the two practical questions.
- (2) Candidates were specific in responding to the oral aspect of the questions.
- (3) Candidates were able to use the tools and equipment provided with ease.

3. SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Candidates were slow in carrying - out the task assigned them.
- (2) The majority of the candidates observed poor safety precautions measures.
- (3) Candidates were not able to pick the correct tools for right assigned task.

4. SUGGESTED REMEDIES

- (1) Teachers should encourage candidates to attach themselves to mechanics during the long vacation.
- (2) Teachers should intensify their practical activities with their students.
- (3) Teachers should lay more emphasis on identification of tools and equipment.

5. DETAILED COMMENTS

QUESTION 1

From the vehicle provided:

- (a) **check the brake fluid level. Report to the Examiner;**
- (b) **remove the master cylinder. Report to the Examiner;**
- (c) **remove a wheel, as indicated by the Examiner;**
- (d) **inspect the wheel cylinder. Report to the Examiner;**
- (e) **refit the master cylinder. Report to the Examiner;**
- (f) **explain to the Examiner the process of bleeding;**
- (g) **refit the wheel. Report to the Examiner;**
- (h) **Answer two relevant questions from the Examiner.**

- (a) Checking of the brake fluid level was done with ease by the majority of the candidates as the master cylinder is marked to indicate maximum and minimum fluid levels.

- (b) To remove the master cylinder, the brake fluid is drained. The pipe is disconnected, and the securing nuts are removed to detach the master cylinder. A good number of the candidates performed the task successfully.
- (c) To remove a road wheel, the vehicle must be parked on a flat ground and one other wheel wedged. The wheel nuts of the particular wheel is slacked, and the vehicle is jacked up and supported with axle stand. The wheel nuts are then removed after which the roadwheel is also removed. The majority of the candidates were able to carry out this task.
- (d) To remove the wheel cylinder, the brake drum must first be removed. The wheel cylinder is inspected for leakage, seizure of the piston, worn cylinder and weak rubber boots and seals. Majority of the candidates performed well.
- (f) The purpose of bleeding the brake is to remove any air trapped in the braking system which may render it ineffective.
To bleed the brake, ensure there is enough fluid in the master cylinder. Clean the bleed nipple and connect it with a flexible transparent hose whose end is dipped below the level of the brake fluid in a transparent container.
The locknut on the nipple is slackened and tightened repeatedly whilst the brake pedal is also pressed. It is very important to maintain the correct fluid level in the master cylinder and ensure the other end of the flexible hose is kept below the fluid level in the transparent container, most candidates found this task beyond their ability.

Candidates' performance was fair.

QUESTION 2

From the engine provided, having both cylinder head assembly and sump removed:

- (a) remove one piston and connecting rod assembly specified by the Examiner;**
 - (b) inspect the condition of the cylinder bore. Report to the Examiner;**
 - (c) remove one compression ring specified by the Examiner;**
 - (d) check the ring for wear and breakage. Report to the Examiner;**
 - (e) refit the compression ring to the piston. Report to the Examiner;**
 - (f) refit the piston and the connecting rod assembly to the engine. Report to the Examiner;**
 - (g) Answer two relevant questions from the Examiner.**
- (a) To remove the piston and connecting rod assembly, the cylinder block is laid on its side. The big end cap nuts are slackened and removed. The crankshaft could be

turned to provide a space to tap out the connecting rod and piston through the upper part of the cylinder bore.

The majority of the candidates performed satisfactorily.

- (b) The condition of the cylinder block is checked by visual inspection coupled with using the hand to feel inside the bore to determine the smoothness and wear.

This was a simple task, but most candidates performed poorly.

- (c) Checking the piston ring for breakage involves inspecting the ring to observe signs of cracks, pitting and marks or scratches.
The correct feeler gauge is selected to measure the gap at the ends of the piston ring and this measurement is compared with the gap of a new piston ring.

Majority of the candidates lacked the skill needed to carry out the task

- (d), (e) and (f) Refitting the compression ring was an easy task for the candidates as the piston ring expander is used to expand the ring into its groove. In the refitting of the piston and connecting rod assembly, the ring compressor is used to compress the rings in the grooves. The big end bearings are lubricated and positioned in the bearing cap.

Majority of the candidates had great challenges in the refitting of the piston and connecting assembly.

The candidates' performance was average.

BUILDING CONSTRUCTION 2

1. GENERAL COMMENTS

The standard of the paper compares favourably with that of the previous years. The performance of the candidates was average compared with that of the previous year.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) Most candidates expressed themselves very well in stating factors to be considered before erecting a timbering system.
- (2) The reasons for curing concrete was well stated by most candidates.
- (3) Most candidates demonstrated improved handwritings making reading of their responses easy.

3. SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Most candidates could not produce the required sketches to answer questions.
- (2) Most candidates could not properly label their sketches.
- (3) Most candidates could not use the right technical words and jargons.

4. SUGGESTED REMEDIES

- (1) Candidates should be taught how to properly produce sketches and constantly practice sketching.
- (2) Teachers should endeavour to complete the topics in the syllabus.
- (3) Students should be encouraged to read wide around the subject to improve their vocabulary in the subject.

5. DETAILED COMMENTS.

QUESTION 1

- (a) **State one use of each of the following in site works:**
 - (i) **wooden pegs;**
 - (ii) **sledge hammer;**
 - (iii) **plumb-bob.**
- (b) **State three duties of a health and safety officer on building site.**
- (c) **Describe how bagged Portland cement is stored in an enclosed shed on site.**

- (a) Most of the candidates were able to answer the first part well but were unable to answer the second and third.

Most candidates stated that the sledge hammer is used for driving nails into wood. The sledge hammer is heavier than the club hammer and is used in breaking up stones and rocks. It is also used for demolishing works.

The plumb-bob is used in checking vertical alignments. It is also used to transfer a trench line marked on a profile board on to the formation level.

(b) Fairly good answers were supplied by most candidates. A few however stated wrong responses.

The health and safety officer is responsible for:

- ensuring that health and safety requirements are observed on site;
- ensuring that all personnel are supplied with protective materials/tools;
- ensuring that the building site is clean and tidy.

(c) Most candidates were able to describe how bagged Portland cement is stored in an enclosed shed on site.

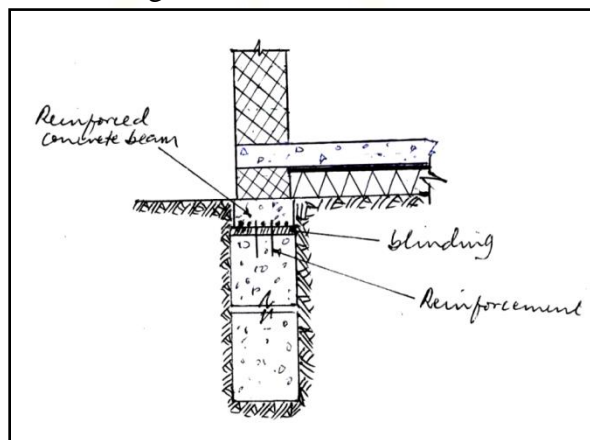
QUESTION 2

- (a) **State three factors to be considered before erecting a timbering system.**
- (b) **Sketch a cross-section through a short-bored pile foundation and indicate the following:**
- (i) **reinforced concrete beam;**
 - (ii) **blinding.**

(a) Most candidates answered this question very well.

(b) Most candidates deviated in answering this question. The demand of the question was for candidates to sketch a cross-section through a short-bored pile foundation and label some stated parts.

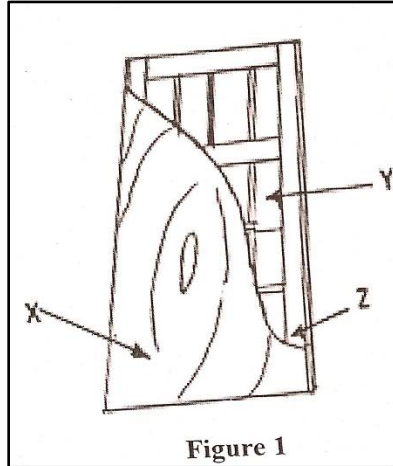
Most candidates however sketched either a wide strip foundation or a deep strip foundation. The expected sketch and labelling is shown below:



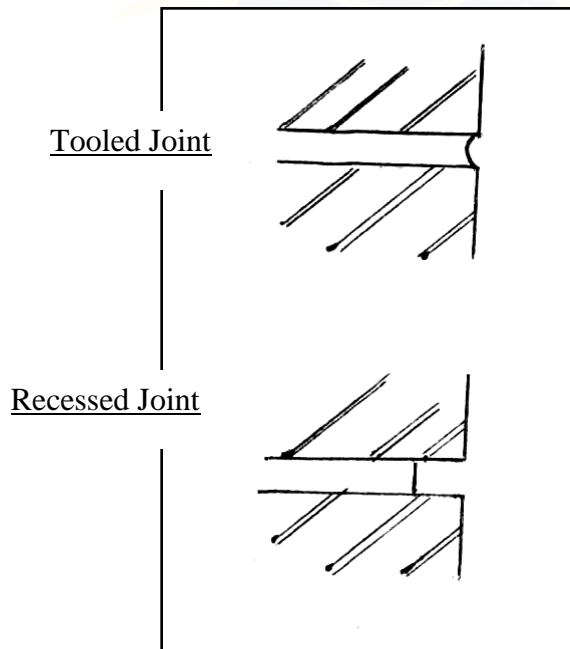
A short-bored pile foundation

QUESTION 3

- (a) State three reasons for curing concrete.
- (b) Sketch each of the following types of pointing in brick walls:
 - (i) tooled joint;
 - (ii) recessed joint.
- (c) Identify the parts of the solid core flush door labelled X, Y, Z in Figure 1.



- (a) Most candidates answered this question very well.
- (b) Most candidates were able to sketch the brick walls but failed to show the correct types of pointing asked for. A few came up with the correct types of pointing demanded by the question. The required answer is:



- (c) Most candidates found it difficult to answer this question. The required answers are:

- The part labelled X is the plywood cover
- The part labelled Y is the lock block;
- The part labelled Z is the stile.

QUESTION 4

- List four defects in cement-sand render.**
- State two advantages of flexible joint over rigid joint as used in drainage scheme.**
- Sketch a parapet wall and indicate the following:**
 - concrete coping;**
 - fillet.**

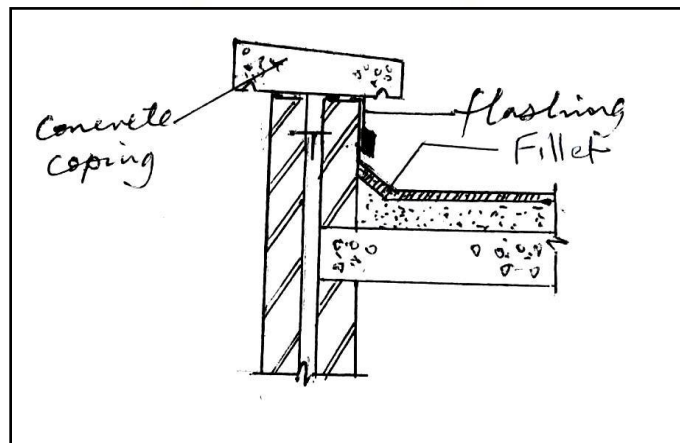
(a) Most candidates provided fair responses to answer this question. A few however associated their responses to painting instead of cement-sand render. The required answers include: crazing, cracking, efflorescence, bond failure, grinning and powdering.

(b) Most candidates could not state all the two advantages of flexible joint over rigid joint as used in a drainage scheme. Candidates' answers were sketchy and lacked substance.

Flexible joint:

- allows for differential movement between the drain pipe and subsoil;
- can be installed in bad weather;
- allows for quick testing and backfilling of the drain;
- can be laid without a concrete bed.

(c) Most candidates could not sketch the parapet wall. The required sketch and labelling is shown below:



A sketch of Parapet wall indicating concrete coping and fillet

QUESTION 5

- (a) State three reasons for paving around a building.
(b) List two functional requirements of a metal gate.
(c) Sketch an elevation of a close boarded fence and label the following parts:
(i) timber rail
(ii) post.

(a) Responses to this question were mixed. Some provided good answers while others were bad.

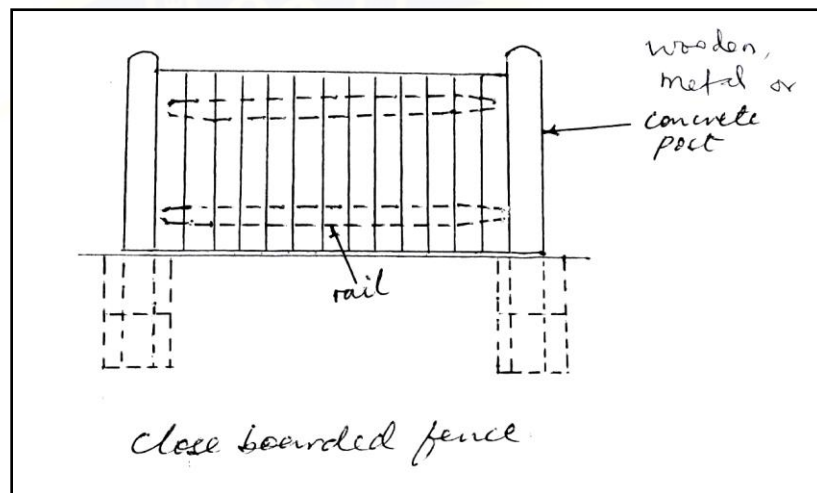
The required answers include:

- to control growth of vegetation around the building;
- to beautify the surrounding;
- to provide a level base for pedestrians;
- to throw off or direct rainwater;
- to check erosion;

(b) Very popular question. It was well answered by most candidates.

(c) Instead of fence, most candidates sketched doors/wooden/metal gates.

The required sketch is shown below:



BUILDING CONSTRUCTION 3

1. GENERAL COMMENTS

The standard of the paper compares favourably with that of the previous years. The performance of the candidates was good compared with that of the previous year.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) Most candidates expressed themselves very well in the English Language.
- (2) Most candidates produced sketches in the right proportion and size.
- (3) Most candidates presented well-arranged work that made for clarity and ease of reading.

3. SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Most candidates could not properly position the damp proof course and membrane as well as hardcore filling, blinding and concrete floor slab.
- (2) A few candidates failed to read and follow the rubrics and therefore answered more questions than required.
- (3) Most candidates sketched a solid ground floor (Q1b) without showing the finished ground level.

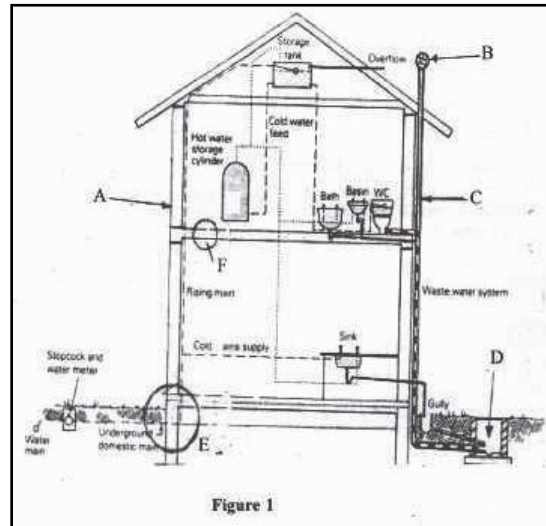
4. SUGGESTED REMEDIES:

- (1) Candidates should be taught how to properly sketch solid ground floor and the proper placement of the various components.
- (2) Candidates should be impressed upon to read the rubrics of every paper before they start answering questions.
- (3) Students should be encouraged to practice how to sketch solid ground floor.

5. DETAILED COMMENTS.

QUESTION 1

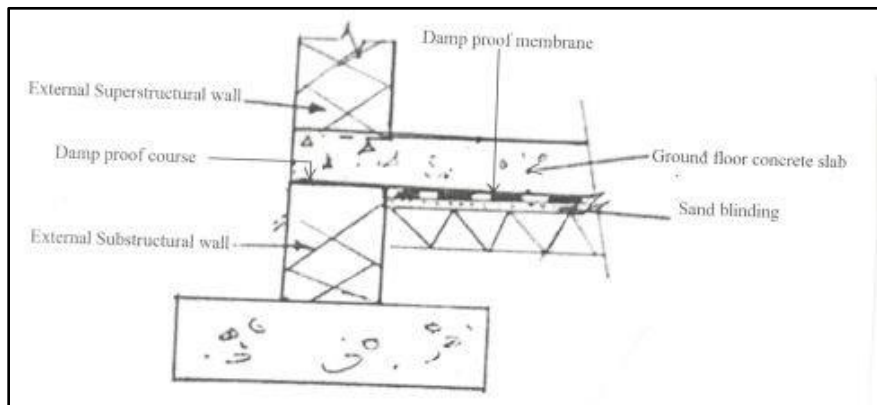
Figure 1 shows a section through a two-storey building on a moderately firm soil. The walls are built with sandcrete blocks. Use it to answer Question 1.



- (a) (i) Identify the elements labelled A, B, C and D.
(ii) State one function of each of the elements A, B, C and D.
- (b) Sketch the constructional detail at E and label the following parts:
(i) external substructural wall;
(ii) external superstructural wall;
(iii) damp proof membrane;
(iv) sand blinding;
(v) concrete ground floor slab.
- (c) (i) List six hand tools used for excavating the foundation trenches.
(ii) State three safety precautions to be observed when working in the excavated trenches.

- (a) Most candidates identified element **D** as manhole instead of inspection chamber. Most candidates however identified the rest of the elements correctly.
- (b) Most candidates sketched the solid ground floor proportionally, however, they could not position the blinding and the sand blinding accurately. Others also labelled the concrete floor slab as hardcore.

The required sketch is shown below:



(c) (i) Most candidates were able to list the right-hand tools. A few however listed equipment and machines such as backactor which is not a hand tool.

(ii) Most candidates satisfactorily answered the question

QUESTION 2

(a) State three functional requirements of a door.

(b) Illustrate five stages involved in building a sandcrete blockwall, six blocks long and two courses high on an existing concrete floor slab, using already mixed mortar.

(c) List two examples of each of the following types of buildings:

(i) commercial;

(ii) institutional.

(a) Most of the candidates who attempted this question answered it satisfactorily.

(b) The majority of the candidates could not answer this question well. The candidates did not follow the right steps and procedures.

The required stages are shown below:

1. Set out/make the position of the wall.
2. Spread mortar bed at the locations of the first and the last block in the 1st course of block.
3. Plump the 1st block and the last block in position.
4. Align the intermediate blocks on mortar for 1st course of blocks and caulk them in position.
5. Spread mortar bed on the 1st and last blocks in the first course of blocks.

6. Set the 1st and last blocks in the 2nd course of blocks and check the horizontal and vertical alignments.
 7. Spread mortar bed on the top of the intermediate blocks in the 1st course of blocks.
 8. Set the intermediate blocks in the 2nd course of blocks and check the vertical and horizontal alignments.
 9. Caulk the blocks in position and wipe of mortar droppings.
 10. Protect wall, allow to cure.
- (c) This question was wrongly answered by most candidates. Some mentioned mosque, church, museum and others as commercial buildings. The required answers are:
- (i) Commercial – shops, showrooms, markets
 - (ii) Institutional – classroom building, assemble hall, dining hall in a boarding school, school library

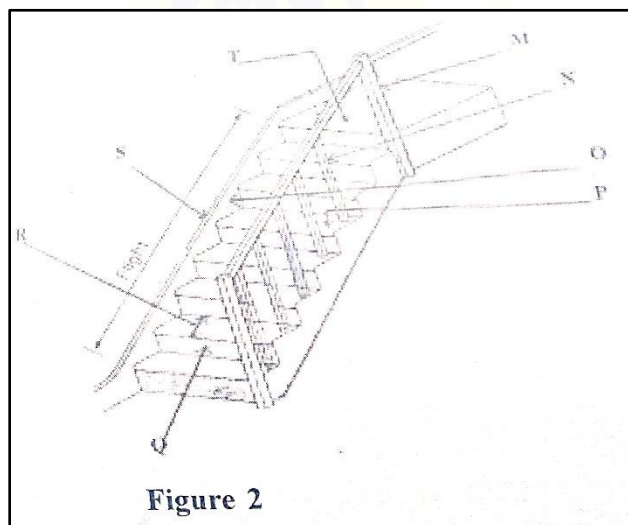
QUESTION 3

(a) **Sketch a cross-section through a pitch roof structure and label the following parts:**

- (i) **fascial board;**
- (ii) **wall plate;**
- (iii) **rafter;**
- (iv) **external wall.**

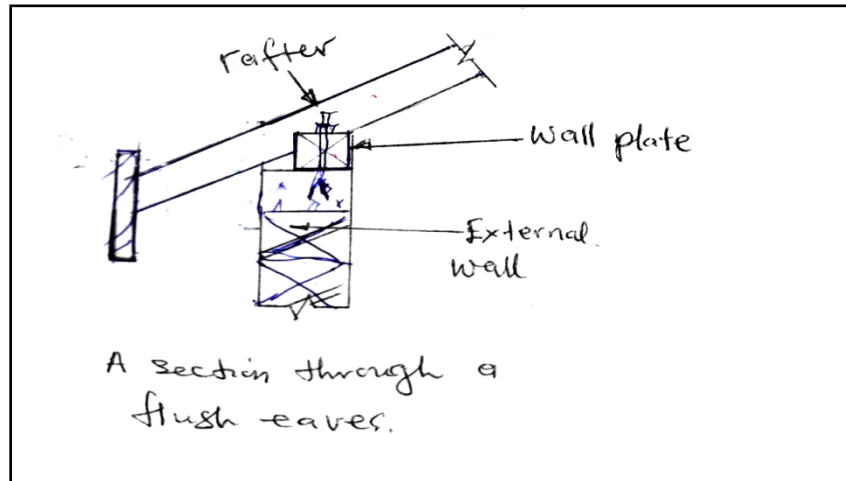
(b) **State one use of a material specification document for a building project.**

(c) **Identify the parts labelled M, N, O, P, Q, R, S and T on the straight flight stair shown in figure 2.**



- (a) Most of the candidates produced well labelled sketches. A few however produced sketches devoid of correct detailing at anchoring the roof to the external load bearing wall.

The right sketch is shown below:



- (b) Most candidates' responses were generally satisfactory.
- (c) Most candidates' responses were good. A few however could not identify elements **O** and **S**. Element **O** is face of the string and **S** is top of the string for the staircase.

QUESTION 4

- (a) **State three reasons for providing concrete cover for steel reinforcement bars in concrete works.**
- (b) **State one use of each of the following documents on a construction site:**
- waybill;**
 - pro-forma invoice;**
 - attendance register.**
- (c) **State one function of each of the following parts of a scaffold:**
- standard;**
 - toe board;**
 - putlog;**
 - platform.**

- (a) Most candidates who attempted this question could not answer it well. Most of the responses were off target. The required response is stated below:
- protect steel against corrosion;
 - provide enough concrete to make a good bond;
 - protect the steel bars against fire hazard;
 - provide better anchorage for the steel bars.
- (b) Almost all the candidates who attempted this question could not state the use of the waybill and pro-forma invoice. The uses are:

(i) Waybill:

- use to check movement of goods and materials on site;
- Provide records of materials /tools and equipment delivered to or taken from site;
- Provides records of the dates of materials/tools and equipment brought to site for the purpose of assessing fluctuations.

(ii) Pro – forma invoice:

- Used to evaluate cost variations result of variations in works;
- Used to assess the need for granting contractors requests for extensions at project durations.

(c) Most candidates' responses were satisfactory.

QUESTION 5

(a) List ten personnel a building contractor engages on a building project.

(b) State five points in a drainage scheme that require the provision of inspection chambers.

(a) A very popular question among candidates. Some candidates however listed personnel such as quantity surveyor, structural engineer, building inspector, etc. instead of carpenters, painters and plumbers. The required answers include:

- | | |
|---------------------|--------------------|
| i) Contract Manager | ii) Time Keeper |
| iii) Mason | iv) Carpenter |
| v) Plumber | vi) Painter |
| vii) Concreter | viii) Store Keeper |
| ix) Steel bender | x) General Foreman |
| xi) Tiler | xii) electrician |

(b) Most candidates stated three points instead of the five demanded by the question.

The required answers include:

- Every change of direction;
- Change in gradient;
- At head/beginning of drain length;
- At 90m maximum intervals on a straight run;
- If there's a change in pipe size;
- If two pipes come together at a junction.

QUESTION 6

- (a) State three operations involved in site clearing.**
- (b) Describe each of the following types of foundation:**
 - (i) ordinary strip;**
 - (ii) wide strip.**
- (c) Explain the term setting out as used in building construction.**

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

(b) Most candidates could not answer this question very well. Most candidates tried to use sketches to do the description.

The sketches were however poorly done. The few who tried to use words to describe the types of foundations lacked the use of the proper technical jargons to do the description.

The required answers are indicated below:

(i) Ordinary Strip:

This foundation is for most subsoils, light structural loadings such as those encountered in low-rise to medium rise domestic dwelling mass concrete is used.

(ii) Wide Strip:

This foundation has same depth as ordinary strip. It is used where ordinary strip becomes inadequate in width to distribute the loads over a safe bearing surface and hence the need for a wider width such that tension and shear stresses are induced, therefore, reinforcement is introduced.

(c) Most candidates answered this question very well.

ELECTRONICS 2

1. GENERAL COMMENTS

The standard of paper was good and compared favourably with that of previous years. The overall performance compared with that of the previous years was generally poor.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) The majority of the candidates had fair knowledge of parts of a cathode ray oscilloscope.
- (2) Candidates were able to state some applications of integrated circuit.
- (3) Candidates were able to state some devices that use the principle of electromagnetism in its operation.
- (4) The majority of the candidates drew very good and workable circuit diagrams.

3. SUMMARY OF CANDIDATES' WEAKNESSES

- (1) The majority of the candidates did not demonstrate knowledge and understanding of electronics.
- (2) The majority of the candidates could not answer the questions satisfactorily according to the rubrics.
- (3) Most of the candidates had difficulty in answering the questions properly.
- (4) Most of the candidates did not prepare adequately for the exams.

4. SUGGESTED REMEDIES

- (1) Candidates should read widely on electronic text books to broaden their knowledge in the subject.
- (2) Candidates should be taught the techniques of answering questions.
- (3) Some recommended text books (Electronics) should be made available to students. Examples: Electronics made easy by F. Fillyord, Exploring Electronics by Boss M, The Semiconductor theory by Parker & Parker, etc.

5. DETAILED COMMENTS

QUESTION 1

(a) State four parts of a cathode ray oscilloscope.

(b) State the function of the following in a measuring instrument:

(i) Shunt resistor;

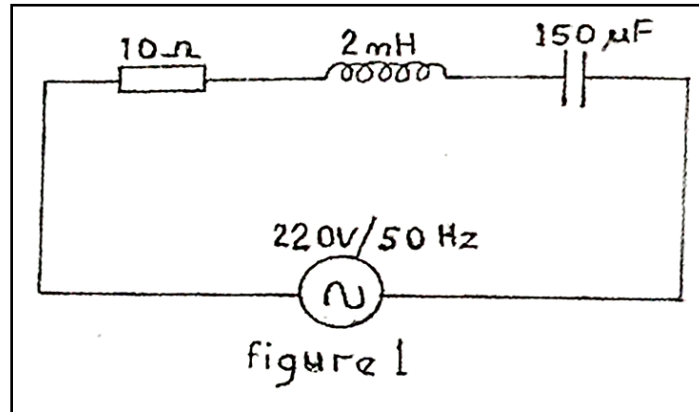
(ii) Multiplier resistor.

- (a) Candidates' response to the question was good. The majority of the candidates were able to state parts of a cathode ray oscilloscope correctly.

- (b) The majority of candidates could not state the functions of shunt and multiplier resistors in a measuring instrument correctly. Candidates' response was very poor. A shunt resistor serves to bleed excess current away from a meter while a multiplier is a high resistance used to drop excess voltage.

QUESTION 2

Figure 1 is a series RLC circuit.



- (a) Calculate the:
- Resonant frequency;
 - Q-factor.

Candidates' response to the question was fair. Some of the candidates were able to calculate the resonant frequency correctly while others too had difficulty in solving the problem.

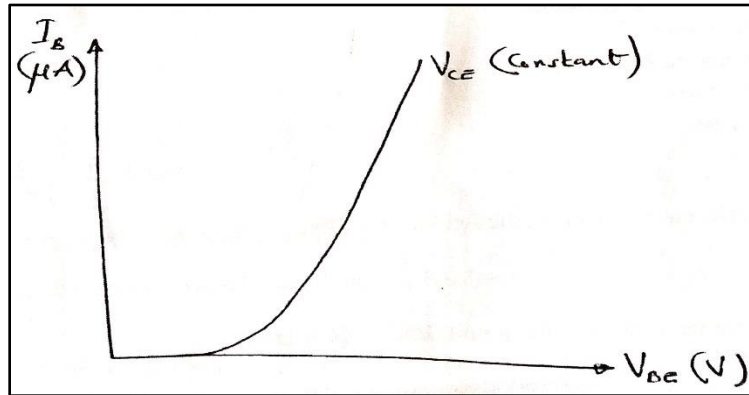
Majority of the candidates had little idea about Q-factor. Candidates' performance was very poor.

QUESTION 3

- State three advantages of a semiconductor diode over vacuum diodes.
- State four applications of integrated circuits.
- Draw the input characteristics curve of a transistor in common emitter configuration.

- Candidates' performance was good. Most of the candidates were able to state three advantages of semiconductor diodes over vacuum diodes.
- Candidates' performance was also fair. Some of the candidates were able to state four applications of integrated circuits correctly. However, a few candidates did not live up to expectation.
- Candidates' performance was very poor. Majority of the candidates had little idea about the input characteristics curve of a transistor in common emitter configuration.

Expected response from the candidates should be



QUESTION 4

- (a) **State Faraday's Law of electromagnetic induction.**
- (b) **List four devices that use the principle of electromagnetic induction in its operation.**
- (c) **A current of 10 A flows through a coil of inductance 20H. Calculate the energy stored in the coil.**

- (a) Most of the candidates failed to state the laws of Faraday. Also, most of the candidates found it difficult to state the laws correctly. Candidates' performance was average.
- (b) Candidates' performance was good. Most of the candidates were able to list devices that use the principle of electromagnetism in its operation.
- (c) Candidates' performance was poor. Most of them could not calculate the energy stored in the coil.

QUESTION 5

- (a) **Define Class A amplifier.**
- (b) **Draw a common base transistor amplifier configuration.**
- (c) **A common emitter amplifier has an output collector current of 50mA and a base current of 70μA, calculate the current gain (hfe).**

- (a) The majority of candidates could not define Class A amplifier correctly.
- (b) Candidates' response was poor. Majority of candidates could not draw and label a common base transistor amplifier configuration.

The performance was very poor.

- (c) Candidates' performance was fair. Some were able to calculate the current gain correctly while some also had challenges in solving the problem.

QUESTION 6

- (a) Describe the principle of operation of an oscillator.**
- (b) List four types of oscillators.**
- (c) State two applications of an oscillator.**

- (a) Majority of candidates could not describe the principle of operation of an oscillator. Candidates' performance was very poor.
- (b) Candidates' response to the question was good. Majority of the candidates could list four types of oscillators.
- (c) Candidates performance was very poor. Majority of them failed to state two applications of an oscillator.

The expected responses are:

The oscillator's operation is based on positive feedback, for which the Barkhausen's criteria are satisfied.

That is, loop gain $BA = 1$ and phase shift around the feedback loop = 0^0 (or 360^0).

QUESTION 7

- (a) Define the following with respect to modulation:**
 - (i) Carrier wave;**
 - (ii) Modulating signal.**
 - (b) Compare the open loop and closed loop control systems in terms of the following;**
 - (i) Accuracy;**
 - (ii) Stability;**
 - (iii) Automation.**
- (a) Candidates' performance was very poor. Candidates could not define carrier wave and modulating signal correctly.

The expected responses are as follows:

- (i) Carrier wave is usually a high frequency sinusoidal signal, of whose physical attributes (amplitude; frequency; phase angle) is made to change in step.

Or

It is a high frequency signal that can be modulated in terms of amplitude, frequency or phase by a modulating signal.

- (iii) Modulating signal is an intelligence-bearing signal, which (modulates) causes the amplitude, frequency, or phase of a carrier wave to vary with time.
- (b) Candidates were able to compare the open loop and closed loop control systems correctly.

ELECTRONICS 3

1. GENERAL COMMENTS

The standard of paper was comparable to that of the previous years.

The general performance of this year as compared to that of the previous years was good.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) Candidates were able to perform both experiments appropriately.
- (2) Candidates were able to use their results to draw good graphs.
- (3) Most candidates understood the principles of how a zener diode operates.

3. SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Some of the candidates continue to provide irrelevant information which was not demanded in the rubrics; e.g., redrawing of the circuit and pictorial diagrams in the answer booklet.
- (2) Some of the candidates were not able to transfer the theory knowledge into practical activities.
- (3) Some of the candidates had problem in recording the readings correctly in the table.

4. SUGGESTED REMEDIES

- (1) Candidates should be encouraged to provide relevant information.
- (2) Candidates should remember that all practical activities are based on theory topics. They must therefore be able to transfer the theory knowledge into practice.

5. DETAILED COMMENTS

Candidates were provided with the following apparatus:

One variable d.c. power supply unit (0-12 V)

Two multimeters;

One zener diode (6V) or its equivalent;

Two 1 k Ω , $\frac{1}{4}$ W resistors;

Two 5.6 k Ω , $\frac{1}{4}$ W resistors;

One toggle switch (S);

One soldering iron with resin-cored solder;

Veroboard/Quick test board;

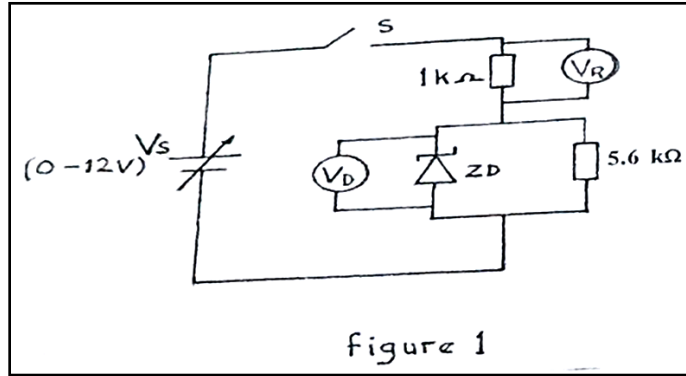
Connecting wires;

Long nose plier;

Side cutter.

QUESTION 1

AIM: To determine the zener voltage of a zener diode.



- (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.

Table 1

V_S (V)	0	2	4	6	7	8	9	10
V_R (V)								
V_D (V)								

- (d) Set the power supply unit to 0 V.
- (e) Close switch (S).
- (f) Read and record in Table 1, the values of V_R and V_D .
- (g) Open switch (S).
- (h) Repeat steps (d) to (g) for the other values of V_S in Table 1.
- (i) From your result in Table 1, determine the zener voltage.

The question required the candidates to perform an experiment to determine the zener voltage of a zener diode under the following instructions.

Candidates were to measure the voltage (V) across the resistor and the zener diode respectively by varying the source voltage.

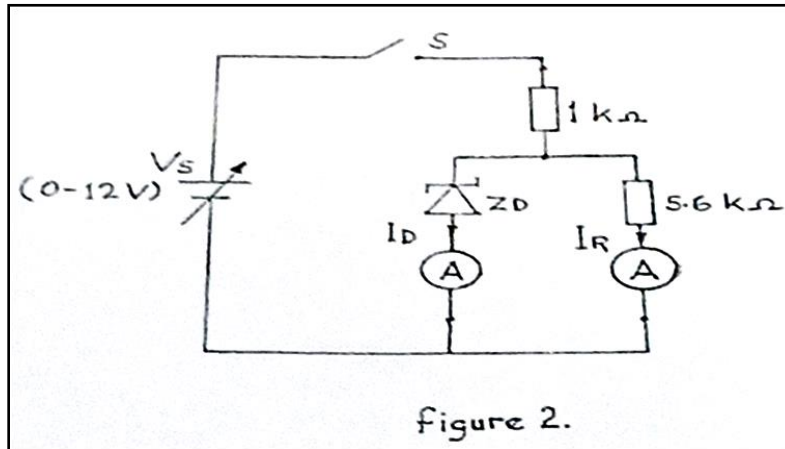
From the results candidates should determine the zener voltage.

Majority of the candidates connected the circuit diagram correctly, had very accurate results for the resistance voltages (V_R) and diode voltages (V_D).

Candidates' performance was good.

QUESTION 2

AIM: To investigate zener action on a given load.



- Connect the circuit as shown in Figure 2.
- Ask the supervisor to check the circuit connection.
- Copy Table 2 into your answer booklet.

Table 1

V_S (V)	0	2	4	6	8	10
I_D (mA)						
I_R (mA)						

- Set the supply voltage V_S to 0 V.
- Close switch (S).
- Read and record in Table 2, the values of I_D and I_R .
- Open switch (S).
- Repeat steps (d) to (g) for the other values of V_S in Table 2.
- Plot a graph of I_R (mA) on the vertical axis against V_S (V) on the horizontal axis.
- Comment on the effect of the zener diode on I_R when:
 - V_S is less than the zener voltage;
 - V_S is greater than the zener voltage.

The question required the candidates to perform an experiment to investigate zener action on a given load circuit under the following instructions.

- Candidates were to measure the current (I) through the diode and the resistor respectively at varying source voltage.
- From the readings, plot a graph of I_R (mA) on the vertical axis against V_S (V) on the horizontal axis.

- (iii) Comment on the effect of the zener diode on I_R when
- a. V_S is less than zener voltage;
 - b. V_S is greater than zener voltage.

Most candidates could not obtain a linear graph as a result of not being able to locate the points of best fit.

Candidates' performance was generally fair.



INFORMATION AND COMMUNICATIONS TECHNOLOGY (ELECTIVE) 2,

1. GENERAL COMMENTS

The standard of the paper compared favorably with the previous papers in the areas of content and level of difficulty.

The performance of candidates declined as compared to the previous year.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) Candidates answered the questions as demanded by the rubrics.
- (2) A fairly good number of candidates exhibited good knowledge of the subject matter.
- (3) A greater number of candidates expressed themselves much better in the English language than had been the practice in previous years.
- (4) Candidates showed good knowledge in number systems.

3. SUMMARY OF CANDIDATES' WEAKNESSES

The following were the main candidates' weaknesses identified:

- (1) Inability to appreciate the key requirements of the questions.
- (2) Little or no evidence that candidates planned answers before writing them down.
- (3) Some of the candidates had bad handwriting.
- (4) Some candidates demonstrated in their answers that they had little or no knowledge of the examination syllabus.
- (5) Candidates showed poor understanding in SQL and Flowchart concepts.

4. SUGGESTED REMEDIES

- (1) Candidates should carefully read through the questions, selecting those to be attempted and planning the answers before writing them out.
- (2) Candidates should learn with suitable textbooks and material on ICT and carefully use the Internet as a learning tool.
- (3) Candidates should be encouraged to write legibly.
- (4) Candidates should avoid the use of inappropriate standards of communication such as those they often use on the various social media platforms.
- (5) Candidates should allow for time to read through their answers to correct any errors as well as add further details.
- (6) Teachers of the ICT Elective subject should learn to adhere to the syllabus as much as possible and refrain from teaching just anything they see in their textbooks since it has been discovered that some of the textbook materials are incorrect / inappropriate.

5. DETAILED COMMENTS

QUESTION 1

- (a) What is *octal number system*?
- (b) Convert the following octal numbers into binary:
- (i) 71;
- (ii) 37.
- (c) Convert the following decimal numbers into octal:
- (i) 924;
- (ii) 379.

Performance was generally good on this question. The main weakness exhibited by many candidates was the fact that they failed to consider the octal digits as decimals to be converted into three-bit groups of binary numbers.

The expected solution is as follows:

- (a) The octal number system is the system of counting numbers that uses a base of eight and utilizes the numbers zero (0) to seven (7).
- (b) (i) 71_8 converts to 111001_2

71₈ converting to base ten

8^1	8^0
7	1

$$(7 \times 8) + (1 \times 1) = 56 + 1 = 57$$

Converting 57 base ten to base two

2	57	
2	28	R 1
2	14	R 0
2	7	R 0
2	3	R 1
	1	R 1

(ii) 37_8 converts to 011111_2

37_8 converting to base ten

8^1	8^0
3	7

$$(3 \times 8) + (7 \times 1) = 24 + 7 = 31$$

Converting 31 base ten to base two

2	31	
2	15	R1
2	7	R1
2	3	R1
	1	R1

(c) (i)

8	924	
8	115	R4
8	14	R3
	1	R6

924 converts to 1634_8

8	379	
8	47	R3
	5	R7

379 converts to 573_8

QUESTION 2

- (a) Explain the term *computer assisted learning*.
(b) State *three* features of computer assisted learning.

Satisfactory knowledge was exhibited by a sizeable number of the candidates who answered this question.

The required solution is:

- (a) The term computer assisted learning (CAL) covers a range of computer-based packages, which aim to provide interactive instructions usually in a specific subject

area, and many pre-date the Internet. These can range from sophisticated and expensive commercial packages to applications developed by projects in other educational institutions or national initiatives to simple solutions developed by individuals to tackle a very local problem.

(b) Features of computer assisted learning

- Ability to move forward and backward through the course at user's own pace.
- Ability to stop at any point and return to that point later.
- Testing and scoring and feedback will be provided to users as they progress.
- Ability to continue retaking the test until user passes or is sufficiently confident with the skills required.

QUESTION 3

(a) (i) **What is *universal serial bus*?**

(ii) **State *two* benefits of using universal serial bus connection between a computer and another device.**

(b) **In Table 1, *three* storage devices have been described. Use it to answer questions (i) and (ii) below:**

Table 1

1	2	3	4	5
Description of Storage Device	Name of Storage Device	Category of Storage Device		
		Primary	Secondary	Offline
Magnetic storage medium which is composed of a thin flexible disc sealed in a square plastic carrier				
Optical medium which uses one spiral track; red lasers are used to read and write data on the medium surface; makes use of dual-layering technology to increase the storage capacity to over 1GB				
Non-volatile memory chip; contents of the chip cannot be altered. It is often used to store start-up routines in a computer (e.g. BIOS)				

- (i) In column 2, name the storage devices described in column 1.
- (ii) Show the category of storage device described in column 1 by ticking in any of the columns 3, 4 or 5.

The suggested solution follows:

(a) (i) Universal serial bus (USB) is the most popular device used to connect a computer to devices such as digital cameras, printers, scanners, external hard drives among others. The USB port is outside the system unit.

(ii) **Benefits of using USB**

- Device is automatically detected and configured when initially attached.
- It supports multiple data transmission speeds.
- It is supported by many operating systems.
- It is faster in transmission compared to wireless connections.
- It supports multiple device connections.

(b)

1	2	3	4	5
Description of storage device	Name of storage device	Category of Storage Device		
		Primary	Secondary	Offline
1	Floppy Disk		*	
2	Digital Versatile/Video Disc		*	
3	Read-Only Memory	*		

QUESTION 4

Table 2

Field	FirstName	SecondName	DateofBirth	Sex	Height	Weight
Table	Students	×	×	×	×	×
Sort						
Criteria						
OR						

Table 3

Field	FirstName	SecondName	DateofBirth	Sex	Height	Weight
Table	Students	Students	×	×	×	×
Sort						
Criteria					< 1.2	< 10
OR						

Table 4

Field	StudentID	English	Mathematics	Physics	Chemistry	Biology
Table	Exams	Exams	Exams	Exams	Exams	Exams
Sort						
Criteria		40				
OR						

Table 5

Field	StudentID	English	Mathematics	Physics
Table				
Sort				
Criteria			30	55
OR				

Write SQL statements to interpret the query by example in:

- (a) Table 2;**
- (b) Table 3;**
- (c) Table 4;**
- (d) Table 5.**

This question was not attempted by most of the candidate. The few candidates who attempted it provided incomplete answers.

The solution is as follows:

- (a) SELECT FirstName, SecondName, DateofBirth, Sex, Height, Weight
FROM Students;**
- (b) SELECT FirstName, SecondName, DateofBirth, Sex, Height, Weight
FROM Students
WHERE Height > 1.2 OR Weight < 10;**
- (c) SELECT StudendID, English, Mathematics, Physics, Chemistry, Biology
FROM Exams
WHERE English = 40;**
- (d) SELECT StudentID, English, Mathematics, Physics
FROM Exams
WHERE Mathematics = 30 AND Physics = 55;**

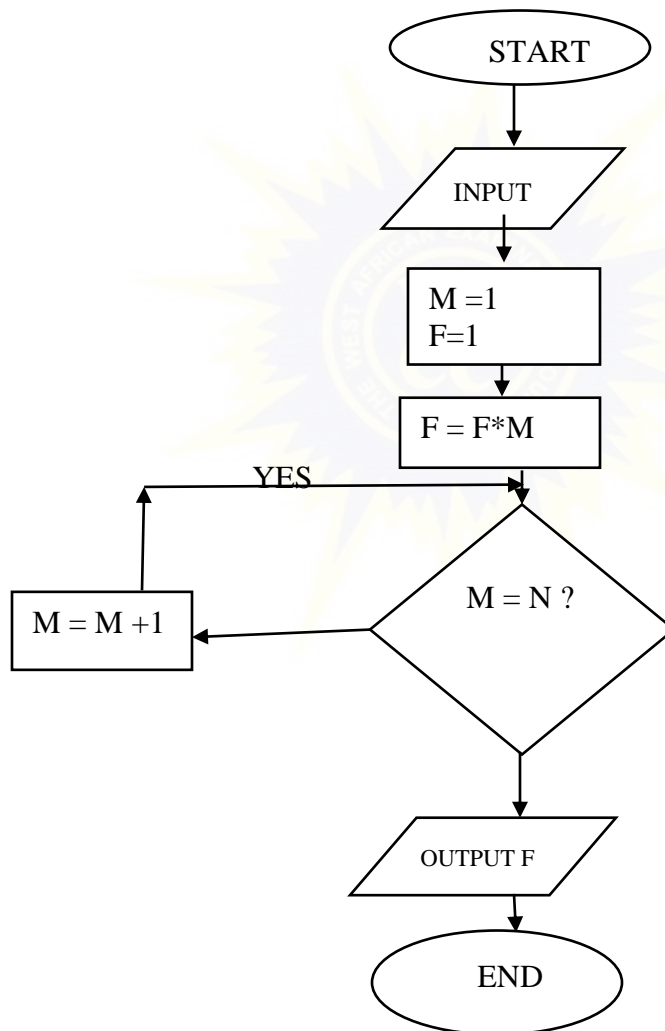
QUESTION 5

Draw a flowchart to compute N factorial, where N factorial is expressed by the formula:

$$N! = N(N-1)(N-2)(N-3)(N-4) \dots 1$$

There were only a few satisfactory answers to this question. Most candidates did not appreciate the difference between END and STOP. They replaced END with STOP in the final symbol.

Most of the candidates lost sight of the fact that for a program flowchart, the flow lines are from left to right. However, flows in the opposite directions require arrows. The solution is as follows:



INFORMATION AND COMMUNICATIONS TECHNOLOGY (ELECTIVE) 3

1. GENERAL COMMENTS

The standard of the paper and that of the previous year examination is the same. It was noted that candidates' performance has much improved compared to the previous year.

It has, however, been observed that performances continued to be localized, i.e., excellent performances are concentrated at certain schools while bad performances are also concentrated at certain schools.

This year witnessed some candidates scoring high marks in all questions.

2. SUMMARY OF CANDIDATES' STRENGTHS

SPREADSHEET

Candidates were able to:

- (1) create conditions tables;
- (2) create calls tables;
- (3) populate data;
- (4) save workbook.

HTML

Candidates were able to

- (1) create the basic structure correct;
- (2) correct row alignment;
- (3) populate table;
- (4) set the correct heading level 1 for "Continuous Assessment";
- (5) set the correct page title.

DATABASE

Candidates were able to:

- (1) create database named DBCUSTOMERS;
- (2) create data fields with correct data types;
- (3) create correct Lookup table for country.

3. SUMMARY OF CANDIDATES' WEAKNESSES

Many candidates had challenges in the following areas:

SPREADSHEET

- (1) calculation of amount payable per customer;
- (2) creating conditions table;
- (3) calculation of maximum amount due for trunk calls;
- (4) calculation of maximum amount due for local calls;

- (5) calculation of maximum amount due for foreign calls;
- (6) calculation of total amount due the operator of the call centre that day.

HTML

- (1) correct table structure (correct row span and column span);
- (2) correct column header alignment (centre).

DATABASE

- (1) creating fields with correct data format;
- (2) creating Customer-ID;
- (3) creating Tel-Number.

4. SUGGESTED REMEDIES

- (1) Teachers must continue to make efforts to improve the logical reasoning skill in candidates to help in the development of programming skills.
- (2) Teachers must pay attention to the curriculum requirements and should not underrate the expectations of the ICT curriculum. They must stress on technical approach in teaching ICT.
- (3) Candidates must be encouraged and assisted to pick up personal ICT projects structured in a manner which will compel them to eventually be practical in their approach to the subject and cover significant aspects of the subject. It will also lay the foundation for their research abilities before getting into the tertiary level.

5. DETAILED COMMENTS

QUESTION 1

CALL CHARGES

Type of Call	Amount for First 3 Minutes	Amount for Every Additional Minutes
Local	10	5
Trunk	20	10
Foreign	30	15

Customer Name	Call Type	Duration in Minutes
Yoko	Local	8
Fafana	Foreign	10
Ali	Foreign	9
Yaba	Trunk	20
Mawusi	Local	13
Kali	Local	2
Ogbara	Foreign	3

One requirement is to use the above data in a spreadsheet application to calculate

- (a) Maximum Amount for Local calls
- (b) Maximum Amount for Trunk calls
- (c) Maximum Amount for Foreign calls

The following is an approach to solving the problem.

Local = a fixed amount for zero(0) to three (3) minutes or part thereof **PLUS** (amount per minute for minutes above three **X** the minutes above three(3) (i.e) total minutes for that call -3 if and only if the total minutes is greater than three(3).

Since the charges are populated in a charges table, the specific cell which applies to the specific type of call is referenced in the formula using the \$cell letter \$cell number. Thus the first three minutes of local call is in cell C5 and used in the formula as \$C\$5. This will remain reference as such through out all Local call charge calculations.

The varying part is the charge for the extra minutes above the basic three. This is (D12-3) for the first local call in the calls table.

The charges for the minutes above three minutes for local calls is also fixed at D5 and is therefore referenced as \$D\$.5

The amount for the extra minutes will therefore be
 $(D12-3)*\$D\5

Hence \$D\$5 will continue to be used for wherever local calls are made more than three minutes.

Hence, the charges for local call for Yoko will be

$$\text{Local 8} = \$C\$5 + ((D12-3) * \$D\$5)$$

Similarly, foreign call charges for Fafana will be

$$\text{Foreign 10} = \$C\$7 + ((D13-3) * \$D\$7)$$

And the Trunk call for Yaba will be :

$$\text{Trunk 20} = \$C\$6 + ((D15-3) * \$D\$6)$$

Some candidates computed the maximum of all the charges. This is not what was required by the question.

- (i) Maximum Amount for Local calls finds the maximum of ALL Local calls alone. Hence the formula is **MAX(E13:E14,E18)**. The function for finding the maximum is MAX(range of values). The range of values for local calls is in the cells **E13,E14,E18**.
- (ii) Maximum Amount for Trunk calls finds the maximum of ALL Trunk calls alone. Hence the formula is MAX(E15)). The The range of values for Trunk calls is in the cell **E15** alone.
- (iii) Maximum Amount for Foreign calls finds the maximum of ALL Foreign calls alone. Hence the formula is MAX(E12,E16:E17). The range of values for Foreign calls is in the cells E12,E16,E17).

QUESTION 2

Continuous Assessment

Index No	Candidate	Subjects	
		English	Mathematics
1000	Dennis Brown	56	80
10001	Robert Asante	85	70
INDEX	NAME	MARK	MARK

The solution to the question is expected to follow the pattern explained below.

HTML is a standard and the layout follows a specific structure to allow for correct interpretation for presentation. The structure of an html document is as follows:

```

<!DOCTYPE html>
<html>
<head>
<title>Titleofthedocument</title>
</head>

```

```
<body ATTRIBUTES>
Thecontentofthedocument.....
</body>
</html>
```

It must be noted that the title is part of the head tag. Placing it outside the head is not a correct structuring even though you can have the title correctly displayed.

The body tag is not part of head tag as some have sort to do.

Candidates have paid attention to indentation of code for readability.

The following is sample solution to the question.

```
<!DOCTYPE html>
<html>
<head>
<title>Class 1 Assessment </title>
</head>
<body>
<H1>Continuous Assessment</H1>
<table width="50%" border="1">
<tr>
<td align="center" rowspan="2">Index No </td>
<td align="center" rowspan="2">Candidate</td>
<td align="center" colspan="2">Subjects</td>
</tr>
<tr>
<td>English</td>
<td>Mathematics</td>
</tr>
<tr>
<td>1000</td>
<td>Dennis Brown </td>
<td>56</td>
<td>80</td>
</tr>
<tr>
<td>10001</td>
<td>Robert Asante </td>
```

```

        <td>85</td>
        <td>70</td>
</tr>
    <tr>
        <td>INDEX</td>
        <td>NAME</td>
        <td>MARK</td>
        <td>MARK</td>
    </tr>
</table>
</body>
</html>

```

Candidates were required to use the Heading 1 tag to write “Continuous Assessment”. This requires the use of the <h1> tag.

QUESTION 3

Use an appropriate database application to design a database and name it **DBCcustomers** in the folder created.

- (a) Create a table in the database with the following fields:
 - (i) **Customers-Id**: Format this field such that it accepts only letters as the **first two** characters and only numeric for the last four characters. Example **ZZ8888**
 - (ii) **First Name**: Text
 - (iii) **Last Name**: Text
 - (iv) **Country**: Must be formatted to be a **Lookup field** with the following regions displayed in the combo box to be selected from: Ghana, Togo, Benin, Nigeria, Seria Leone and Kenya
 - (v) **Location**: Text
 - (vi) **Tel-Number**: Must be formatted to appear like 030-X-XXX-XX. It must accept only numeric with X as a place holder
- (b) Save the table as tblCustomers
- (c) Enter the following records into the table:
- (d) Create a query to show the fields Customer-Id, Customer_Name, Country, Location and Tel-Number from the tblCustomers, where Customer_Name is the merged fields of the First_Name and Last_Name from the tblCustomers
- (e) Save query as QRYCUSTOMERS

Candidates’ performance was good. However, some candidates entered the semi-colon (:) at the end of the filed names as part of the field name which was not required.

Also, some specified input pattern required on Telephone Numbers and Customer-ID was a challenge to most of the candidates.

The Input Mask pattern for the Telephone Number is (000)-0-000-00 or \000'-'0\000\00 and that for Customer-ID is LL0000 or !AA000;



METALWORK 2

1. GENERAL COMMENTS

Generally, the standard of the paper was within the scope of the syllabus and compared favourably with that of the previous year

The performance of candidates as compared with that of previous years was not encouraging.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) Majority of the candidates answered the required number of questions.
- (2) A few of the candidates answered the questions very well and scored high marks.

3. SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Majority of the candidates could not sketch and label two parts of the ball pein hammer.
- (2) Wrong spelling of words made it difficult for examiners to understand what the candidates meant and therefore lost marks.

4. SUGGESTED REMEDIES

- (1) Students should be encouraged to practise how to sketch tools and equipment used in the workshop.
- (2) Tutors should mark students' exercises regularly and check their spellings.
- (3) Tutors should cover the prescribed syllabus and engage students in practical activities.

5. DETAILED COMMENTS

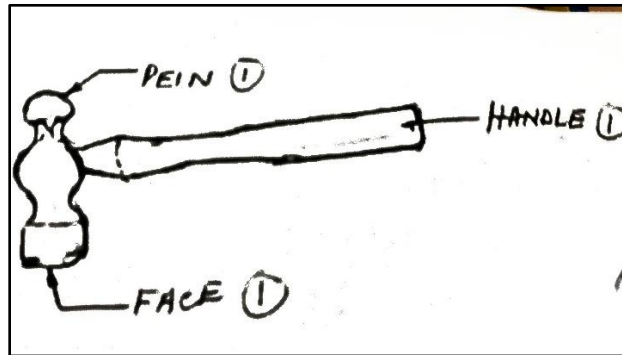
QUESTION 1

- (a) **State the reason why chiselling is directed away from other workers.**
- (b) (i) **Sketch a ball pein hammer;**
(ii) **Label two parts of the hammer sketched in (b)(i).**
- (c) **State two workshop tests used to check the hardness of cast iron.**
- (d) **State one function of each of the following used in welding:**
 - (i) **Hand shield;**
 - (ii) **Chipping hammer.**

This was a popular question and some candidates' performance generally was good.

- (a) Most candidates stated the reason why chiselling is directed away from other workers.
- (b) i – ii Majority of the candidates could not sketch and label two parts of the ball pein hammer. Some candidates sketched different hammers and instead of labelling two

parts of the sketch, they rather wrote the names of the parts on a different part of the answer booklet.



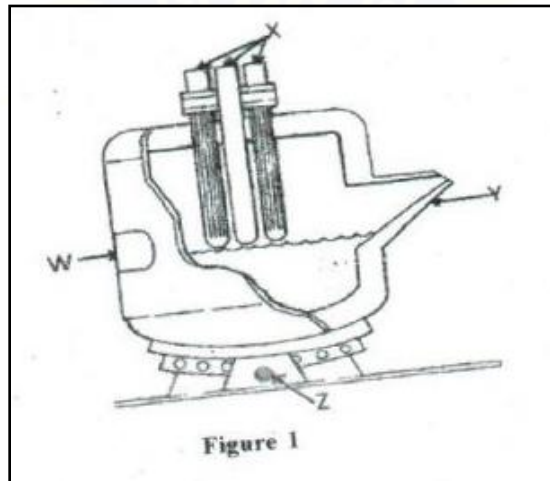
- (c) Some candidates were able to state two workshop tests used to check the hardness of cast iron.
- (d) A few candidates could not state one function of hand shield used in welding.

The expected answers include:

- To protect the face from hot sparks
- To protect the eyes from intense rays

QUESTION 2

(a) The sketch in Figure 1 is a furnace.



- (i) Identify the type of furnace;
 - (ii) List the parts labelled W, X, Y and Z;
 - (iii) State the function of the part labelled X;
 - (iv) What is the finished product of the furnace?
- (b) State the function of the plug tap used in thread cutting.
- (c) State the use of a hot set-in forging process.

Most of the candidates did not answer this question. Those who answered it provided answers that were not convincing.

- (ai) Candidates failed to identify the furnace as an Electric Arc Furnace.
- (aii) The parts labelled W, X, Y and Z are: charging door, carbon electrodes/poles pouring spout and Trunion. Candidates' performance was poor.
- (aiii) The function of the part labelled X is to supply the required heat, majority of the candidates had it wrong.
- (b) A few candidates stated the function of the plug tap used in thread cutting. The plug tap is used to complete the thread of through holes and blind holes, to form the full threads to be very close to the bottom of the hole.
- (c) Candidates stated the use of hot set-in forging process; that is for cutting hot metals.

QUESTION 3

- (a) State one function of the clapper box of the shaping machine.**
- (b) State one function of each of the following parts of a pedestal grinding machine:**
 - (i) Tool rest;**
 - (ii) Wheel gaurd;**
 - (iii) Perspex shield.**
- (c) List three areas where design problems could be identified.**
- (d) State two analysis questions of economic importance in design work.**

This was a popular question. However, performance generally was not very good.

- (a) This part of the question demanded that candidates state one function of the clapper box. They failed to state that it can be used to hold the tool post and it enables the tool to cut on the forward stroke and be lifted on the reverse stroke.
- (b) (i) The tool rest of a pedestal grinding machine is either used to support tool for grinding or used to set over for grinding the front angle of the lathe cutting tool.
(ii) One function of the wheel guard of a pedestal grinding machine is it is used to protect the user of the machine from accidents by flying off broken wheels.

(iii) This part of the question was well answered. The Perspex shield on the grinding machine is used to protect users' eyes from grit particles.
- (c) Majority of the candidates listed three areas where design problems could be identified. For example, Hospitals, Homes, Markets, Schools, and Garages.
- (d) Some candidates could not state two analysis questions of economic importance in design work. Some of the expected responses should have been: Is the unit cheap? What will be the cost of the materials for making the unit?

QUESTION 4

- (a) (i) What is shrinkage in casting?**
- (ii) How can shrinkage be prevented in casting.**
- (iii) State one effect of shrinkage on casting.**
- (b) Explain in three steps the process of blueing a workpiece.**
- (c) List three forge fire tools.**

This was a popular question. Performance of candidates generally, was not encouraging.

- a) (i) Shrinkage in casting is a process whereby a cast product reduces in size upon cooling. Most of the candidates poorly answered this part of the question.
- (ii) Shrinkage can be prevented in casting by providing shrinkage allowance on the metal during cooling in the solid state. Majority of the candidates performed poorly.
- (iii) Some of the candidates could not state one effect of shrinkage on casting. The effects include; producing undersize finished products, lacking machining allowance and no allowance for fettling.
- b) Candidates explained in three steps, process of blueing a workpiece.
- c) The three forge fire tools candidates were to list include; tongs, poker, rake, shovel.

QUESTION 5

- (a) State one reason each why the following heat treatment processes are carried out on metals:**
 - (i) Normalizing;**
 - (ii) Annealing;**
 - (iii) Case hardening;**
 - (iv) Tempering.**
- (b) State the difference between drilling and reaming.**
- (c) State one suitable surface finishing process for each of the following:**
 - (i) Aluminium dishes;**
 - (ii) Bicycle frames;**
 - (iii) Sheet steel litter bins.**

This was a popular question. However, candidates' performance was poor.

- a) Candidates could not state one reason each why the following heat treatment processes are carried out on metals:
 - (i) Normalising: – It is carried out to refine the grain structure after prolonged heating of the metal.
 - To relieve strains, stresses and fine cracks developed in the metal after heating.
 - To improve and restore fine grain structure.

- (ii) Case hardening: – It is carried out on mild steels to enable hard outer skin to be provided on the metal whilst the inner remains tough and soft.
- (iii) Tempering: – It is carried out on hardened metals to remove some of the extreme hardness and brittleness to enable the metal to be toughened.

Candidates rather than providing the above reasons stated the processes for heat treating metals using the above methods.

- b) A few candidates could state the difference between drilling and reaming. Drilling involves originating/creating a hole in materials using drills while reaming is a machining process carried out to enlarge an existing hole drilled.
- c) This part of the question demanded that candidates state one suitable surface finishing process for each of the following:
 - (i) Aluminium dishes – Anodising, polishing.
 - (ii) Bicycle frames – zinc coating, painting chromium plating.
 - (iii) Sheet steel litter bins – painting, plating, galvanising.



METALWORK 3

1. GENERAL COMMENTS

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

Candidates' performance was good.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) A great number of students successfully produced the circular parts of both pieces.
- (2) Majority of the candidates worked to accurate sizes.
- (3) All the candidates understood and interpreted the detailed drawings provided for the exercises.
- (4) All the candidates completed the exercise within the time allocated for the work.
- (5) Candidates observed safety rules to avoid accidents.
- (6) Candidates faithfully followed and adhered to the rubrics of the examination especially as regards the handling of their finished work.

3. SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Candidates lack effective handling and use of bench and hand tools.
- (2) Most candidates failed to clean sharp edges to finish the artefact in safety condition.
- (3) Most candidates failed to follow basic and best practices usually resulting in poor work.
- (4) Inability to use appropriate measuring tools for accurate control of dimensions and sizes.
- (5) Inaccurate fitting/filing practices leading to mismatch of parts requiring final mating.
- (6) Candidates lack skills in lathe machining, hence, their inability to attempt the machining exercise i.e., Question 2.

4. SUGGESTED REMEDIES

- (1) Students should be encouraged to use all tools correctly when carrying out any exercise.
- (2) Students should be encouraged to adopt the habit of deburring finished work – for cleanliness and safety purposes.
- (3) Students should be taught the basic skills of metal working practice.
- (4) Candidates should be trained in the effective use and application of measuring tools to carry out measurements.
- (5) Candidates should be given sufficient exposure to enable them file well.

5. DETAILED COMMENTS

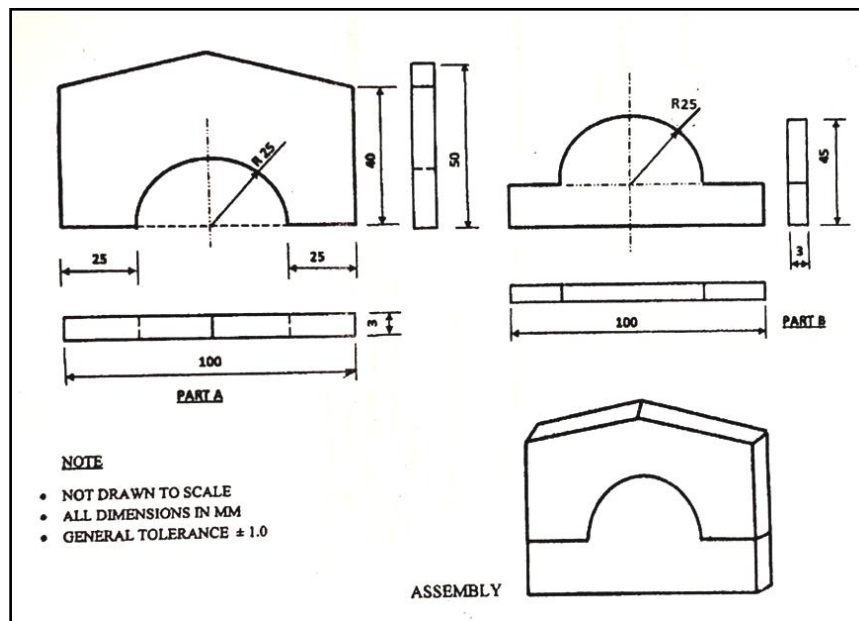
The paper consisted of two practical questions. Question 1 is a fitting exercise and Question 2 is a machining exercise and candidates were required to answer only one of the questions.

QUESTION 1

The following materials are supplied:

- One flat mild steel plate, 105mm x 55mm x 3mm (2 off);
- One cotton bag, 120mm x 120mm to enclose the finished work;
- Two tie-on labels.

The diagram below shows the assembly and detailed views of each part of a fitting exercise. Using the materials supplied, prepare the parts and assemble the pieces.



Candidates were supplied with the following materials:

- One flat mild steel plate 105mm x 55mm x 3mm – 2 off.
- One cotton bag 120mm x 120mm to enclose the finished work.
- Two tie-on labels.

Candidates were therefore required to use the above materials and prepare all the parts indicated in the detailed drawing for the fitting exercise and assemble all the pieces produced to give the product as shown in the assembly drawing.

Part A – Candidates were expected to first mark out the work outline per the dimensions given on the detailed drawing on one of the given pieces i.e. 105mm x 55mm x 3mm. After scribbling out, the candidates were required to dot punch through the scribbled outline of

the figure to make the outline more conspicuous. Obtaining the figure on the metal plate, candidates were expected to hacksaw through the dot-punched outline close to the finished size.

Candidates could chain drill through the semi-circular part of the workpiece and chisel out thereafter.

Alternatively, candidates could use a drill size big enough to drill a hole close to the outlined figure and hacksaw or chisel out thereafter. After drilling and cutting, candidates were expected to use appropriate rough file to file out the excess metal so that the workpiece could be completed to the required size using the smooth file.

Majority of the candidates were able to follow the right procedures as stated above to obtain the workpiece for Part A.

Part B – Similarly, candidates were required to mark out, dot punch the figure in the detailed drawing on the other flat mild steel plate supplied to candidates.

Again, candidates were expected to hacksaw or chisel through the dot punched outline to obtain a figure close to the specified dimensions of the detailed drawing.

Candidates were expected to complete the piece by smooth filing through cut out outline. Many candidates successfully followed the right procedures or steps to obtain the Part B. After completing the two pieces, candidates were required to assemble all the pieces together to realize the artefact shown in the detailed drawing.

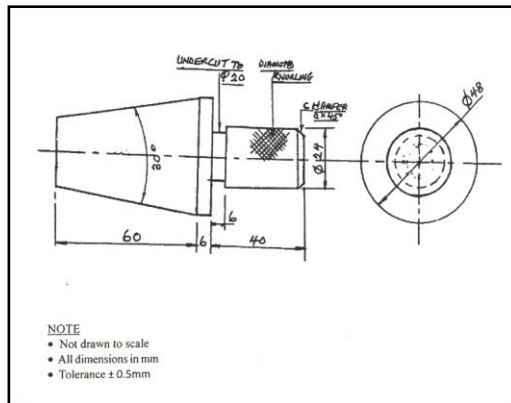
Many candidates met the expected requirement as regards the realization of the final product.

QUESTION 2

The following materials are supplied:

- (a) One-piece free cutting mild steel rod, \varnothing 50mm x 110mm;**
- (b) One cotton bag, 120mm x 120mm to enclose the finished work;**
- (c) Two tie-on labels.**

The diagram below shows the detailed view of a machine part. Produce the part using the material supplied.



Candidates were supplied with the following materials:

- One-piece free cutting mild steel rod, $\text{Ø}50\text{mm} \times 110\text{mm}$;
- One cotton bag, $120\text{mm} \times 120\text{mm}$ to enclose the finished work;
- Two tie-on labels.

Candidates were therefore expected to use the rod supplied to produce the part indicated in the detailed drawing.

- Candidates were expected to set up the given rod in the lathe machine check and face the two ends to the specified length of 106mm from the detailed drawing.
- Candidates were again required to centre drill and hold the workpiece between centres to enable the outside diameter 48mm to be turned after facing the ends of the rod.
- From the RHS of the workpiece held between centres, candidates were required to further turn down to the diameter $24\text{mm} \times 40\text{mm}$ length.
- Again, from the length 34mm , the undercut diameter $20\text{mm} \times 2\text{mm}$ depth could be produced before setting off the compound slide of lathe machine to half of the included angle to cut the taper $30^\circ \times 60\text{mm}$ long from the LHS of the set up.
- Furthermore, candidates were expected to knurl the RHS of the rod to a length of 34mm using a diamond knurling tool to produce a medium finish on the workpiece.
- Once more, the candidates were required to further cut or form changer at the RHS of the knurled end using a form tool ground to the given 45° of the changer.
- Regrettably, no candidate attempted to produce or perform the exercise required in question 2.

TECHNICAL DRAWING 2

1. GENERAL COMMENTS

The standard of the paper compared favourably with those of the previous years.

Candidates' performance as compared with the previous years was good.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) The conversion of orthographic projection to isometric projection was good.
- (2) Candidates adhered to the correct conventional representations e.g., centre lines, hatching of cut surfaces.
- (3) Placing of views at their correct positions.
- (4) There was improvement in the types of pencils used. Majority of the candidates did not use BB pencils for outlines. This need to be the case.
- (5) Candidates' line works were neat and perfect. Less double outlines and outlines were clearly identified from construction lines.

3. SUMMARY OF CANDIDATES' WEAKNESSES

- (1) Candidates did not adhere to the rubrics.
- (2) A few candidates continued to use the BB type pencils for their drawings and sliding the T-Square or Set Squares on their worked sheets made them very dirty.
- (3) Candidates should digest each question very well for them to get the constructional procedures before attempting the question.
- (4) Candidates used different units e.g. m or mm attached to the drawings, thus their work sometimes became very large or very small.

4. SUGGESTED REMEDIES

- (1) Teachers should insist on correct use of pencils for all drawings.
- (2) Furthermore, candidates should read all questions into details and get the understanding before attempting each question.
- (3) Teachers should conduct regular tests and let students construct most of the geometrical works constantly.
- (4) Candidates should be taught how to convert one basic unit into another.

5. DETAILED COMMENTS

QUESTION 1

(a) **The circumference of a circle is 115.**

(i) **Determine by construction the diameter of the circle.**

(ii) **Measure and state the length of the diameter.**

(b) (i) **Construct an escribed circle to a triangle of sides 50, 65 and 75 to touch the shortest side of the triangle.**

(ii) **Measure and state the radius of the circle.**

(a) **DETERMINATION OF A DIAMETER OF A CIRCLE BY CONSTRUCTION**

The length of 115mm as the circumference was drawn as 75mm. Candidates reduced the length wrongly. The circumference, 'AB', was bisected and one side was taken as a radius to describe semi-circle on the circumference. The same radius was used with one end of the semi-circle to draw an arc to intercept the semi circle at point B. A perpendicular was drawn to intercept the circumference line at C. Using C as centre and a radius CB, an arc was drawn to intercept the circumference line at D. Line AD is the required diameter.

Candidates' procedure was wrong and those who managed to construct it did not measure and state the length AD as the diameter.

(b) **CONSTRUCTION OF ESCRIBED CIRCLE TO A TRIANGLE WITH GIVEN SIDES**

Candidates used the three given sides to construct the triangle to perfection. But the two extending sides were poorly done. The two exterior angles were not accurately bisected. The bisector should meet at a point O which will enable the perpendicular to intersect at point D on the extended line. Using the length OD as radius and centre O, a smooth circle was drawn to touch the three sides, thereby producing the escribed circle.

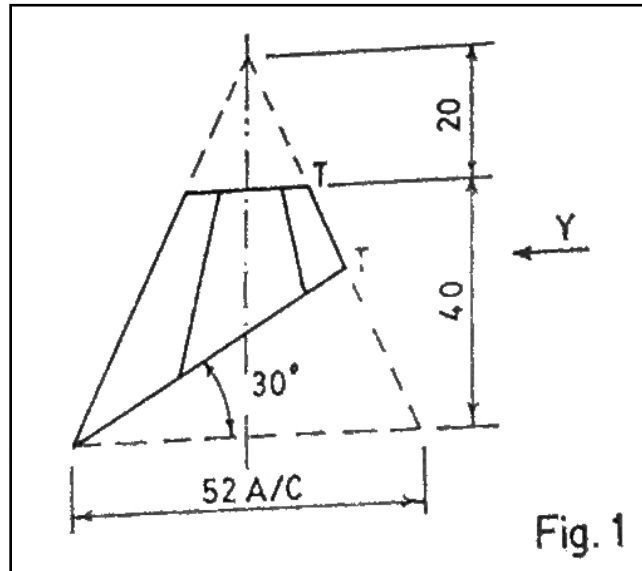
Most candidates produced inscribed circles with poor constructional method.

Candidates' performance was generally poor.

QUESTION 2

Fig. 1 shows a truncated hexagonal pyramid. Draw full size, in first angle projection, the:

- (k) given view;**
- (l) end view in the direction of arrow y;**
- (m) plan;**
- (n) surface development with t-t as seam.**



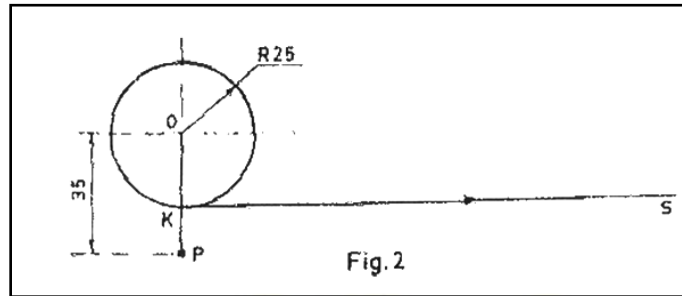
The plan of hexagon 52A/C was drawn and projected up to draw the front elevation to a height of 60mm. The two cutting planes were drawn; one at horizontal and of height 40mm and the other at 30° to the horizontal and from bottom left of the base.

Projectors were drawn from the cut surfaces on the elevation to intercept the diagonals on the plan; first using the horizontal cut surface, then the 30° cut surface on the elevation to draw the plan. Candidates could not draw the two shapes on the plan. Thus, they could not complete the side elevation and the development. The side elevation from arrow Y was completed by carefully following the projectors from the front elevation and the plan to obtain the interceptions of the projectors.

Horizontal lines were drawn, on the front elevation, to intercept the right side. Then using the apex as centre, radial arcs (five in number) were drawn from the intercepting points on the right side/edge. Similarly, radial lines were drawn from the apex to intercept the corresponding radial arcs. The points of interceptions were joined together to obtain the development. Candidates could not construct the development.

QUESTION 3

- (a) Fig. 2 shows a circle with link OP attached to it. The circle rolls along KS without slipping:
- Plot the locus of the point P when the circle makes one revolution;
 - Name the curve produced.
- (b) The sides of a rectangle are 40 and 60:
- Construct a square equal in area to the rectangle;
 - Measure and state the length of a side of the square.



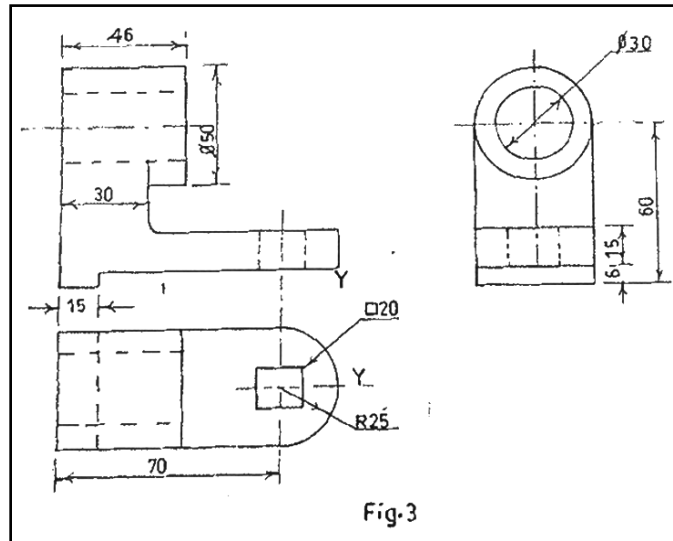
The point 'P' below point 'K' indicated that the circular object was of thickness 10mm and the locus for one revolution was that of a superior trochoid. Candidates used the procedure for the locus of a trochoid which was of similar construction. The only difference was a sharp curve at the beginning and at the end of the locus. The rolling circle was divided into 12 equal parts. The circumference was spread from left to right and divided into same parts. The axis of the horizontal centre line was labelled as series of centre of the rolling circle. Using radius 35mm and at different centres, points of the locus were located. The points were joined with a smooth curve and named as superior trochoid.

Rectangle 60 X 40 was constructed with length 60 as AB and on the baseline. Line AB was extended to the right. Using length 40 as radius and point B as centre, arc was drawn to intercept the baseline extended at E. Length AE was bisected and semi-circle was drawn on AE. The vertical line BC was extended to intercept the semi-circle at point F. Line BF was one side of the square. Line BF was measured and stated as 50 ± 1 mm. Candidates did very well in the construction, but they were unable to measure and state the length of the square of side BF.

Candidates' performance was good.

QUESTION 4

Fig. 3 shows the orthographic projection of a bracket in first angle. Draw full size, the isometric view of the bracket making Y the lowest point.

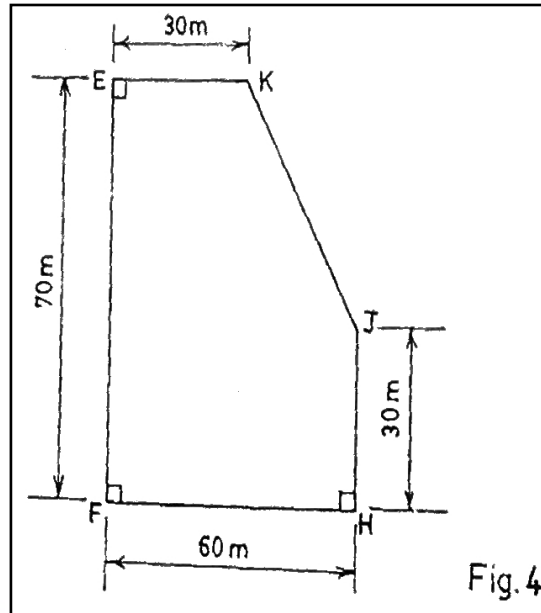


Candidates visualized the orthographic projection into the isometric view. Only the construction of the isometric circles and placing the lowest point were poorly done.

The isometric axes were drawn to the overall dimensions as (30 X 90 X 95) mm. Each view i.e. front elevation, plan and the end, was placed on the axes with careful merging of the faces and ensuring that the lowest point was in place. There were several methods for constructing the isometric circle. There was no restriction of the method used. Candidates produced average work and it was neat and fair.

Candidates' performance was average.

QUESTION 5



A plane figure EFHJK is shown in Fig. 4.

- Draw the figure to a scale of 1mm = 1m.
- Using Bow's Notation, a scale of 1mm = 40m² for the area diagram and a polar distance of 30mm, determine graphically the position G, the centre of the figure.
- State the distances of G from the sides EF and FH

The plate EFHJK was divided into three geometrical figures. (the plate could be divided into any convenient areas that could easily be calculated). In this case, two rectangles and one triangle. The surface areas of each was calculated and converted into the given scale Area 1 = 60m X 30m = 1800m², Area 2 = 40m X 30m = 1200m² and Area 3 = $\frac{1}{2} \times 20m \times 40m = 400m^2$. In conversion, Area 1 = 45, Area 2 = 30 and Area 3 = $\frac{400}{40} = 10$. After writing the Bows' notation, funicular polygons were constructed for both the vertical and horizontal lines of actions. G1 and G2 were obtained and extending them into the plate gave the position of G0 which was the position of the centroid.

Candidates' performance was generally average.

TECHNICAL DRAWING 3

1. GENERAL COMMENTS

The standard of the paper was comparable to the previous years.

The performance of the candidates was average.

2. SUMMARY OF CANDIDATES' STRENGTHS

- (1) Candidates had a good knowledge in the principles of orthographic projection and sectioning.
- (2) Majority of the candidates had very good line work.
- (3) Candidates drew to scale and had accurate assembled blocks.

3. SUMMARY OF CANDIDATES' WEAKNESSES

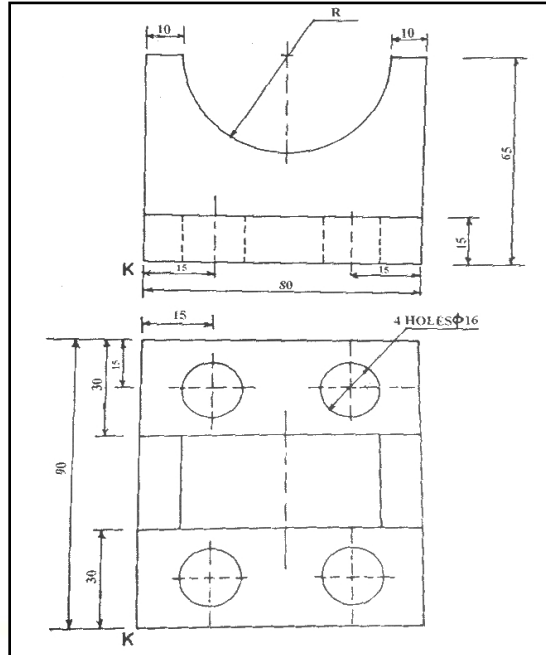
- (1) The candidates lacked skills of freehand sketching, most of the candidates used drawing aids such as rules, set squares, pair of compasses etc.
- (2) Candidates have problem with illustration to show different types of lines used in Technical Drawing. E.g., centre lines, construction lines, outlines etc.
- (3) Layout of various components of the drawing especially in both building and mechanical were haphazardly done.
- (4) Candidates could not draw a bolster.

4. SUGGESTED REMEDIES

- (1) Candidates should be given a lot of assignments and be prepared to work on their own using technical drawing books on mechanical and building drawings.
- (2) The British Standard specifications on engineering and building drawings of various components should be encouraged and strictly adhered to.
- (3) Candidates need to use these conventions appropriately e.g., hardcore, earth filling, concrete, finished floor etc.
- (4) Teachers should teach using demonstrations and improvised teaching and learning aids.
- (5) Teachers should make extra teaching hours to complete the syllabus.

5. DETAILED COMMENTS

QUESTION 1



The figure above shows the plan and elevation of a bearing support in first angle orthographic projection. Make a freehand isometric drawing of the block making K the Lowest point.

This was a very relevant question which required the skill of blending straight lines with curves and showing orthographic views in isometric projection using freehand with point K as the lowest.

Majority of the candidates were able to show the point correctly but could not show the various views. Also, almost all the candidates used guided instruments which was not allowed.

Candidates' performance was average.

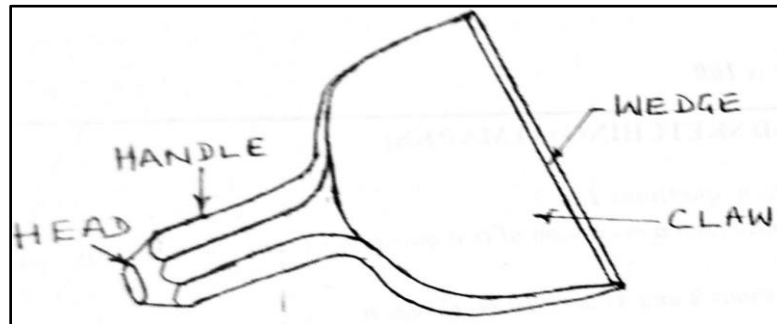
QUESTION 2

Make a neat freehand pictorial sketch of a bolster.

The question was on sketching of a hand tool used in building construction. The responses provided by candidates needs much to be desired.

The candidates only have a little knowledge about the hand tool in question and therefore could not sketch pictorially, the essential parts of the hand tool ie, the body, cutting edge, head and handle.

The required sketch is shown below.



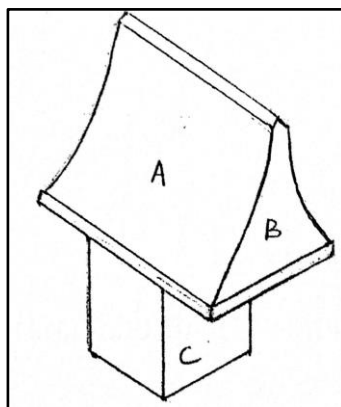
QUESTION 3

Make a neat freehand pictorial sketch of a hardie.

This was also on sketching of a hand tool, in the blacksmith shop.

A few candidates attempted this question, but most of them were found wanting.

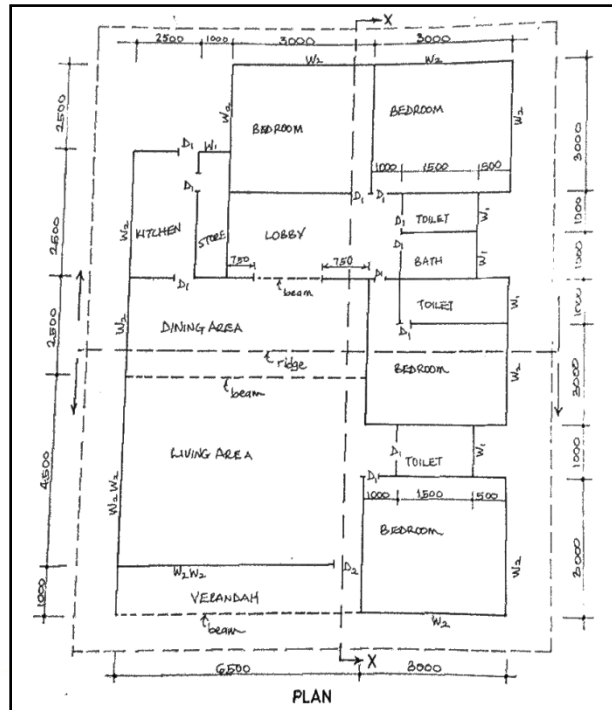
The required sketch is shown below.



Candidates' performance was poor.

QUESTION 4

The sketch below shows the plan of a four-bedroom bungalow. Study the given specifications and answer the questions that follow.



FOUNDATION: 675 x 225 concrete strip at a depth of 900 below the ground level.

FLOOR: 150 concrete slab, 250 hardcore, 25 mortar screed;

Floor to ceiling height is 3000.

WALLS: All walls 225 sandcrete, hollow blocks with mortar rendering 12 on both sides.

DOORS: D₁ - panel, 900 x 2100 x 40 in 100 x 50 timber frame;

D₂ - Aluminium glazed, inward swing double door, 1800 x 2100 x 40 aluminium frame.

WINDOWS: All sliding, aluminium glazed;

W₁ - 600 x 600;

W₂ - 1200 x 600.

LINTEL: 225 x 225 reinforced concrete.

BEAMS: Horizontal, 225 x 225 at 2100 above dining area and the verandah.

ROOF: 45° pitched with eaves 600 and aluminium long span on wooden roof members.

(d) Draw, to scale of 1: 100, the:

(i) floor plan;

(ii) front elevation.

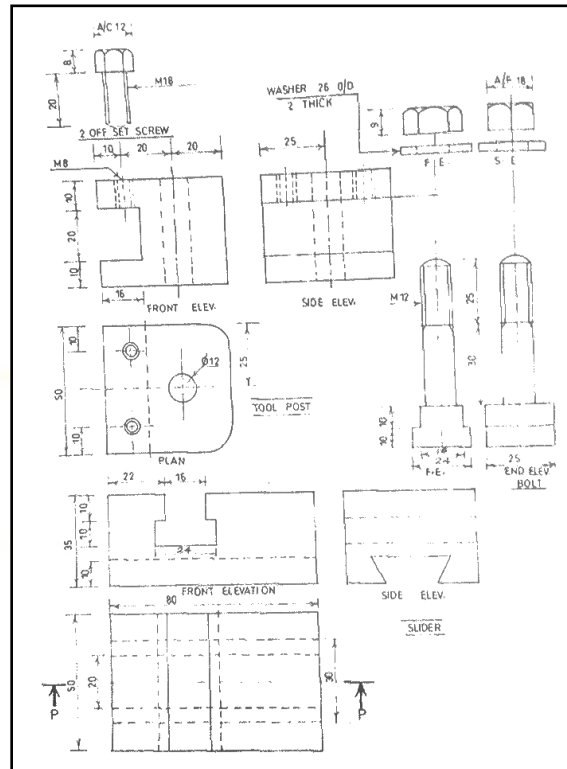
(e) Draw, to a scale of 1: 50, the detailed section on X - X.

This was a very popular question and was attempted by all the building construction candidates. Majority of the candidates were able to draw, the floor and the cross - sectional view correctly.

However, a few of the candidates had problems in drawing correctly, the various building drawing conventions e.g. doors, windows, beams, ceiling and ceiling noggins etc.

Candidates' performance was average.

QUESTION 5



The figure shows the parts of a lathe machine tool post. To assemble the parts, the T-bolt slides into the slot of the slider. The tool post is held in position central to the slider by the T-bolt. The assembly is secured by the nuts and the washers with the two set screws in position.

Draw full size, in first angle projection the:

- (d) sectional front elevation of the assembly on cutting plane P - P;
- (e) end - elevation of the assembly to the right of view (a) above;
- (f) plan of the assembly.

(Hidden details are not required)

This was also a popular question meant for mechanical engineering candidates.

Majority of the candidates understood the principles of first angle projection and therefore drew to perfection.

The following were some of the weaknesses identified:

- Drawing a circle without a centre line or centre line wrongly drawn.
- Missing cutting plane line.

Candidates' performance was average.



WOODWORK 2

1. GENERAL COMMENTS:

The standard of the paper compares favourably with that of the previous years.

The performance of the candidates was average compared with that of the previous year.

2. SUMMARY OF CANDIDATES STRENGTHS

- (1) Most candidates demonstrated good understanding of the Third Angle Orthographic projection.
- (2) Majority of candidates arranged their work orderly. Layout and neatness were satisfactory.
- (3) Most candidates observed the dictates of the rubrics.

3. SUMMARY OF CANDIDATES WEAKNESSES

- (1) Most candidates did not attempt question four. The few who attempted did a poor work.
- (2) Most candidates produced sketches without using the scale given neither did they dimension their drawings.
- (3) Most candidates demonstrated their lack of knowledge in draughtsmanship. They did not produce border lines and title blocks.
- (4) Most candidates produced sketches of cabinet without plinth/stand both for initial drawings and detailed drawings.

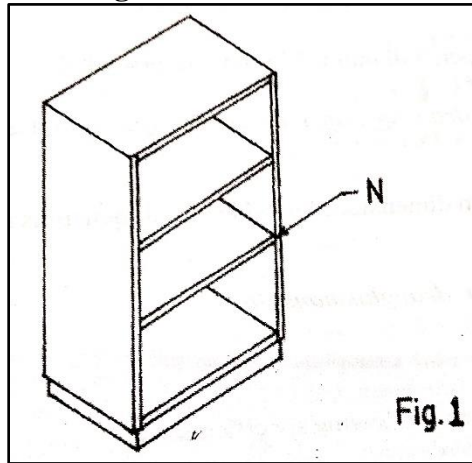
4. SUGGESTED REMEDIES:

- (1) Candidates should be taught how to properly produce sketches and constantly practice sketching.
- (2) Teachers should endeavour to emphasise on the need for candidates to set up their papers on the drawing board, draw border lines, write their names, date and use the scale given, etc.
- (3) Students should be encouraged to read wide around the subject to improve their vocabulary in the subject.
- (4) Teachers should endeavour to complete the syllabus with candidates.

5. DETAILED COMMENTS.

QUESTION 1

Fig. 1 shows the pictorial drawing of a cabinet. Use it to answer question 1.



- (a)
 - (i) Name the most appropriate joint to use at N.
 - (ii) State two operations involved in the construction of the joint at N.
- (b) Name three appropriate tools required for the construction of the joint at N.
- (c) State one reason for applying a finish to the cabinet.

Question 1 was compulsory and was very popular among the candidates. The question was well answered by most of the candidates.

QUESTION 3

- (a)
 - (i) State one use of the circular saw bench.
 - (ii) List four parts of the circular saw bench.
- (b) Describe each of the following methods of decorating an article.
 - (i) moulding;
 - (ii) staining

(a) This part of the question was well answered by the candidates who attempted it.

(b) Only a few candidates were able to describe the methods of staining and moulding an article for decoration purposes. The required answers are:

(i) Moulding:

Mouldings are ornamental shapes or profiles worked along the surface, edges or arises of members. They may be decorative mouldings used to break the plain, square, purely functional appearance of the job by filling-in internal corners, softening or trimming external edges and corners and covering joints between panels and framework.

(ii) Staining:

It is a surface treatment given to timber to enhance the natural colours or appearance. Specific colouring materials called stains are used for staining.

QUESTION 4

- (a) Explain the term pot life in relation to adhesives.**
- (b) State two factors to be considered when ordering screws.**
- (c) Define the term green timber.**

- (a) Only a few candidates attempted this question but were not able to answer it satisfactorily. They were not able to distinguish between *shelf life* and *pot life* of an adhesive. The required answer is; *pot life* of a glue is the length of time the glue remains usable after mixing.
- (b) Most candidates who attempted this question produced very good answers.
- (c) Most candidates could not define the term *green timber*. Only a few were able to define it. A green timber is a timber that has been freshly cut from the log. It is not seasoned and thus contains a lot of moisture.

SECTION B

QUESTION 1

A cabinet is to be designed to the following specifications:

height --- 900;

width --- 750;

depth --- 370.

(All dimensions are in millimeters)

The cabinet is made from 25mm thick solid wood. It is partitioned into two.

Make two different preliminary freehand pictorial sketches of the design of the cabinet.

Most candidates were able to produce two different freehand pictorial sketches of a cabinet. However, most of them did not provide plinth/stand. Again, most of them could not differentiate between partition and shelf.

QUESTION 2

Select one of the sketches in question 1 and indicate with a tick (✓).

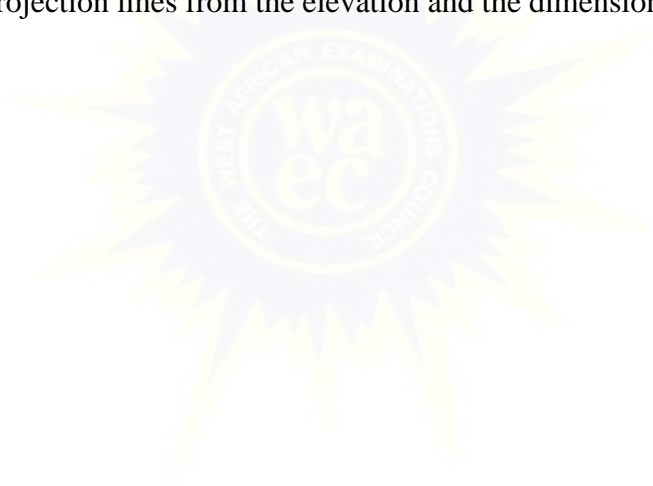
To a scale of 1:5, draw in Third Angle Orthographic Projection the following views:

- (a) the front elevation;
- (b) the sectional end elevation.

(a) Majority of the candidates produced very good drawings of the front elevation in Third Angle Orthographic projection. However, candidates did not draw using the given scale.

Most candidates also did not dimension their drawings neither did they indicate the cutting plane.

(b) Most of the candidates could not construct the sectional end elevation. Most of them could not distinguish between sectional end elevation and the end elevation. Most of them drew the end elevation. Almost all the candidates did not indicate the cutting plane, the projection lines from the elevation and the dimensions.



WOODWORK 3

1. GENERAL COMMENTS

The standard of this year's examination could be measured on equal footings as the past years.

The performance of the candidates as compared with that of the previous years was above average.

2. SUMMARY OF CANDIDATES' STRENGTHS

Some commendable features in candidates' responses included the following:

- (1) some candidates demonstrated detailed knowledge and understanding of the working drawings and interpreted correctly;
- (2) some candidates showed slight improvement in the marking-out practices;
- (3) some candidates demonstrated the ability to construct good joints;
- (4) others also showed the ability to assemble the work.

3. SUMMARY OF CANDIDATES' WEAKNESSES

Candidates' weaknesses were noted in the following areas.

Most candidates were not able to:

- (1) read and interpret the working drawings correctly;
- (2) mark-out accurately;
- (3) cut out perfect joints;
- (4) assemble the work to perfect squareness;
- (5) work to the required dimensions;
- (6) finish their work to give it the required appeal.

4. SUGGESTED REMEDIES

To remedy these weaknesses, it is recommended that:

- (1) the teaching of Orthographic drawing in the schools should be intensified. This will go a long way to enhance candidates understanding and the correct interpretation of working drawings;
- (2) candidates should be given adequate practical exercises which involve the reading and interpretation of working drawings;
- (3) teachers should go the extra mile in demonstrating the skills involved in marking-out the different type of joints used in furniture construction for candidates to emulate;
- (4) teachers should inculcate in the candidates the acquisition of basic practical skills of taking accurate measurements, transfer of measurements from a working drawing onto work pieces, sawing, chiselling out waste, fixing of screws, handling and usage of special purpose hand tools.

5. DETAILED COMMENTS

QUESTION 1

1. **Make the test piece using the timber which has been planed to the following sizes**

(All dimensions are in millimetres):

1 piece hardwood – 210 x 155 x 20;

4 piece hardwood – 190 x 35 x 20;

2 piece hardwood – 190 x 35 x 20;

2 piece hardwood – 100 x 35 x 20;

8 nos. Dowels – 10 x 40 long;

2 nos. CKS – \varnothing 10 x 25.

Candidates were given working drawings of a model tool box. They were required to interpret the working drawings and construct the model using already prepared work pieces.

The work involved the following processes: -

- (a) Construction of bridle joints;
- (b) Construction of dowel joints;
- (c) Shaping;
- (d) Screwing;
- (e) Finishing

1. Four Bridle joints

The construction of the bridle joints was attempted by all the candidates. A greater percentage of candidates were able to mark-out the joints correctly and produced fairly good joints which was worthy of emulation. This notwithstanding, some candidates deviated completely and constructed tee halving joints, stub mortise and tenon joints and simple butt joints, which did not score any meaningful marks. A few others worked with blunt cutting tools which made it difficult for them to cut clean joints.

2. Four Dowel Joints

Candidates were required to mark-out the positions of eight dowel holes on the ends of the two end rails; mark-out the positions of eight dowel holes on the inner faces of the four stool legs; bore eight dowel holes on ends of the two end rails; bore eight dowel holes on the marked inner faces of the four stool legs; prepare eight dowels and insert the eight dowels in the respective bored holes to hold together the four bridle joints and the two end rails. These tasks when properly performed provide a strong, stable under frame ready to receive the stool seat.

Majority of candidates attempted this question. Most of these candidates performed the tasks involved creditably and deserve commendation. A few bored and inserted only four out of the eight dowels which enabled the under frame to be assembled alright but lacked the maximum strength and stability. Very few were able to bore the dowel holes but prepared dowels which were bigger and could not fit into the holes. and others bored dowel holes which were far larger than the dowels prepared hence some dowels held rather loosely and others easily fell off the holes. A few candidates bored dowel holes indiscriminately and made it impossible to receive the corresponding dowels.

3. Shaping

Candidates were expected to mark-out the roundings, cut out waste and dress up the rounding to add beauty to the stool.

Most candidates attempted this question. Some candidates performed the tasks so skilfully that it complemented the aesthetic value of the stools they constructed. However, a good number of them marked out and cut out the waste but left it undressed. A few others only did the marking-out.

4. Screwing

Candidates were expected to mark-out the positions of the two screws, bore pilot holes and drive home the screws to hold firmly the seat to the under frame. Candidates who got this question right deserve commendation for creative thinking. They rightly did counter boring which enabled the screws to hold firmly the seat to the under frame. Others who were unable to counter bore provided loose seats. A good number of candidates failed to fix the seat.

5. Assembling

Majority of the candidates were able to assemble the work, A few did partial assembling very few could not assemble but tied the work pieces for easy identification. Some candidates however left the work pieces mixed up in the boxes which made it extremely difficult for examiners to do the sorting out.

6. Finishing

Almost all the candidates failed to dress the work to give it the needed appeal.