RÉSUMÉ OF TECHNICAL SUBJECTS

1. GENERAL COMMENTS

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

The performance of candidates ranged from fair in Electronics 2, satisfactory performance in Building Construction 3, encouraging in Technical Drawing 3 to good performance in Building Construction 2. The performance in Technical Drawing 2 and 3, Auto Mechanic 2, Auto Mechanics 3, Woodwork 2 and Electronics 3 was average. The performance in Woodwork 3 was above average and very good in ICT elective 2 and 3.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(a) ORDERLY PRESENTATION OF ANSWERS

Some candidates according to the Chief Examiners had their work well numbered and had their work properly spaced out for easy reading. This was reported in Building Construction 2, Woodwork 2 and Technical Drawing 3. The Chief Examiner for Auto Mechanics 3 also reported that most candidates approached their tasks confidently and systematically.

(b) DEMONSTRATION OF IN-DEPTH KNOWLEDGE OF SUBJECT MATTER

It was reported that a few candidates showed excellent knowledge in the subject matter. Candidates showed strengths in performing experiment with circuit diagrams in Electronics 2 and 3. A few candidates presented good quality line work in Technical Drawing 2 and 3, and in Metalwork 2. Auto Mechanics 2 had some candidates explaining principles well and supporting their explanations with accurate sketches. Candidates who sat Technical Drawing 3 were said to have commendable draughtsmanship skills. Interpreting the working drawings covering the work to be produced were well done by many candidates as reported in Metalwork 3 and Woodwork 3. Also, majority of the candidates were able to code in HTML and create database structure in ICT elective 3. For ICT elective 2, candidates provided excellent answers for computer motherboard and ports.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(a) LACK OF ADEQUATE PREPARATION

The Chief Examiners reported that candidates' responses and activities demonstrated inadequacy in their preparation.

Candidates could not identify and make pictorial sketches of basic hand tools in Technical Drawing 3. In Building Construction 2, most candidates did not answer

questions four (4) and five (5) resulting in their inability to answer the number of questions demanded by the rubrics.

(b) LACK OF IN-DEPTH KNOWLEDGE OF SUBJECT MATTER

Some candidates showed weaknesses in different aspects of their subject area. Some candidates could not section their sketches nor label them; most candidates of Building Construction 3 could not appropriately use Technical expressions and jargons in answering questions, and in Auto Mechanics 2, it was reported that candidates' ideas were hazy and incoherent.

(c) NON-ADHERENCE TO RUBRICS OF THE EXAMINATION

Following simple instructions as to the number of questions to answer and details of the demands of the questions were not adhered to by some candidates. A few candidates of Woodwork 2 spent much time to provide sketches for which no mark was awarded. A few candidates answered two questions instead of the four demanded by the rubrics.

(d) LACK OF PRACTICAL EXPOSURE

In Auto Mechanics 3, candidates' weaknesses were reported in their lack of exposure to some particular tools and their usage. Some candidates of the subject could not select the correct tools for the correct job while some had problems fixing parts they had removed. Most candidates of Woodwork 3 were unable to mark out accurately and work to the given dimensions.

4. SUGGESTED REMEDIES FOR THE WEAKNESSES

The following were suggested as remedies for the weaknesses:

(1) Practical work should be intensified by instructors and teachers.
(2) Names and use of tools should form part of the school lessons.
(3) Teachers should endeavour to complete all sections of the syllabus before the examination.
(4) Schools should have all the necessary tools and equipment and instruments including textbooks for the training of students. Teachers must be mindful of books that may contain errors.
(5) Candidates should read over their work to enable them correct errors such as omissions, poor spellings and poor handwriting.
(6) Candidates should be encouraged/taught to answer questions systematically.

APPLIED ELECTRICITY 2

1. GENERAL COMMENTS

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

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Candidates' strength was mostly found in question one, which was based on Faradays Laws of electromagnetic induction, the factors which affect mutual inductance and devices whose operation depend on electromagnetic induction were all well-answered.
(2) Another area which needs commendation is the listing of some power generating stations. It is good for students who write WASSCE to be abreast with generating plants in West Africa and beyond.
(3) Electronic circuit symbols were drawn without much difficulty (e.g. photo cell, diac, triac)

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Definition of final sub-circuit and listing some circuits associated with it, posed much difficulty to some candidates.
(2) Some candidates could not label parameters (maximum value, peak-to-peak value, etc) which go with sinusoidal waveform.
(3) Candidates failed to draw and label the block diagram of a stabilized power supply unit. They did not show the direction of arrows. Candidates should note that correct labelling of diagrams attract marks.
(4) Drawing a single-stage Common-Emitter transistor amplifier posed a great challenge for some of the candidates.

4. SUGGESTED REMEDIES

(1) Revision before examination could help a great deal to improve performance.
(2) Teachers should give homework exercises to students.
(3) Candidates should know the types of electrical wiring including ring circuit.
(4) Learning how to sketch simple electrical circuit and other types of Radio waveforms, e.g. Audio frequency, Radio frequency, AM/FM modulated waveforms.

5. DETAILED COMMENTS

QUESTION 1

(a) State Faraday's law of electromagnetic induction.
(b) State four factors that affect mutual inductance.
(c) State four devices that use the principle of electromagnetic induction.

A well answered question by many of the candidates. Faraday's Law of electromagnetic induction did not pose much problem to many candidates who made an attempt at it. Faraday has two laws and any one of the two laws quoted correctly was accepted.

Devices that use the principle of electromagnetic induction and factors that affect mutual inductance were correctly listed.

Candidates' performance was good.

QUESTION 2

(a) Draw a sinusoidal waveform and indicate the following:
- **(i) maximum value;**
- **(ii) peak-to-peak value;**
- **(iii) a cycle.**

(b) A 415 V/240 V single-phase transformer has a rated primary current of 200 A. If the efficiency of the transformer is 95%, calculate its secondary current.

(c) State two types of power generating stations.

Though the sketch of the sinusoidal waveform was quite good, the parameters such as maximum value, peak-to-peak valve, etc were poorly indicated on the waveform. The cycle covers a distance of (0 to 2π radians or 360°) at a frequency $(F) = \frac{1}{Time} = \frac{1}{T}$ and not a cycle of radius (r) and diameter (d).

Some candidates were able to calculate for only the secondary current neglecting (95%) efficiency of the transformer.

The power generating stations (only two) were stated with ease.

Candidates' performance was good.

QUESTION 3

(a) (i) Define final sub-circuit.
- **(ii) List three final sub-circuits associated with domestic wiring.**

(b) State:
- **(i) the difference between a cable and a conductor;**
- **(ii) one factor that must be considered in the choice of cable sizes for wiring.**

This is a purely electrical installation question and some candidates performed poorly. They could not define or explain the final sub-circuit and list some of the final sub-circuit associated with either domestic or commercial wiring.

Some of the final sub-circuits requested are, Ring wiring circuit, Radial circuit, Lighting circuit, etc.

Some candidates could not distinguish between a cable and a conductor. A cable is a length of insulated single (solid or stranded) wire. A conductor forms part of the cable which allows free flow of current through it.

Some important factors to be considered when selecting a cable size for wiring are the following:

- cross-sectional area of the cable in mm^2;
- current demand by the load in Amps;
- length of the cable, etc

QUESTION 4

(a) State two types of rectifiers.
(b) Draw and label the block diagram of a stabilized power supply unit.

Few candidates managed to draw and label the block diagram of a stabilized power supply unit. Others confused block diagram with circuit diagram. It is important to indicate the direction of arrows for the power supply unit, its input (a.c.) and output (d.c.) voltages.

Candidates' performance was good.

QUESTION 5

(a) State one application for each of the following:
(i) zener diode;
(ii) pn junction diode;
(iii) light emitting diode;
(iv) silicon controlled rectifier.
(b) Draw and label the circuit symbols for each of the following semiconductor devices:
(i) photodiode;
(ii) diac;
(iii) triac.

Candidates are to note that applications for some selected electronic devices do not need any description as some candidates chose to do.

Some candidates were able to sketch correctly the circuit symbol for each device listed. However, they failed to label the symbols as demanded.

Candidates' performance was fair.

QUESTION 6

(a) Define the term amplifier.
(b) Draw a single stage common-emitter transistor amplifier.

Many candidates were unable to draw a single stage common-emitter amplifier as requested.

Candidates' performance was fair.

QUESTION 7

(a) State the difference between the following classes of power amplifier in terms of output current:
(i) Class A;
(ii) Class B;
(iii) Class C.
(b) Sketch the following modulated output waveforms:
(i) frequency modulation;
(ii) amplitude modulation.

Few candidates were able to state the differences in operation of the following power amplifiers with respect to the output current:
(i) Class A
(ii) Class B
(iii) Class C

Many candidates sketched the modulating signal (A.F.) and the carrier signal (R.F.) even though they were not expected to sketch them.

Few candidates sketched the Frequency modulated wave and Amplitude modulated wave correctly.

Candidates' performance was fair.

APPLIED ELECTRICITY 3

1. GENERAL COMMENTS

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

Candidates' performance compared with the previous years was better.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Candidates understood the two experiments and were able to connect the circuit diagram.
(2) Majority of the candidates plotted good graphs.
(3) Majority of the candidates calculated the slope of the graph.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Some candidates could not select good values of scales to enable them plot the points.
(2) Candidates wasted time by copying the questions of experiments 1 and 2 before attempting them.

4. SUGGESTED REMEDIES

(1) Candidates should read many journals and textbooks to broaden their knowledge in the subject.
(2) Teachers should organize more practical exercises for students.

5. DETAILED COMMENTS

Candidates were provided with the following apparatus:
one variable power supply unit (0 – 12 V);
one ammeter (0 – 1000 mA);
one voltmeter (0 – 20 V);
one wire wound resistor 10 Ω, 5 W (R_1)
one wire wound resistor 4.7 Ω, 5 W (R_2)
one single pole switch (S);
one breadboard or its equivalent;
a set of handtools;
connecting wires.

QUESTION 1

AIM: To determine the resistance using voltage-current relationship.

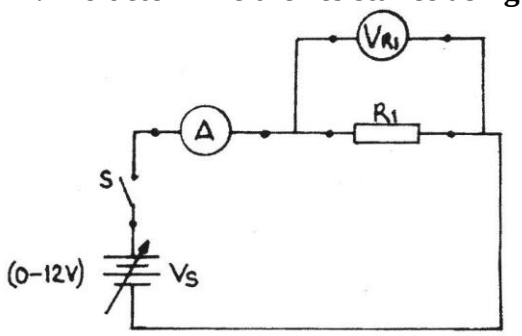


Figure 1

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

Table 1

Voltage (V_S)	**0.0**	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**	**6.0**	**8.0**
Current (mA)								
Voltage (VR_1)								

(d) Switch on the power supply unit.
(e) Set the power supply unit to 0 V and close the switch (S).
(f) Read and record the corresponding ammeter and voltmeter readings in Table 1.
(g) Repeat steps (e) and (f) for the other values in Table 1.
(h) Open switch (S) and switch off the power supply unit.
(i) Plot a graph of current (I) and the vertical axis against voltage (VR_1) on the horizontal axis.
(j) Calculate the slope of the graph.
(k) Determine the resistance of the resistor.

Candidates were to determine the resistance value of an unknown resistor using voltage current relationship. Candidates were able to calculate the slope of the graph and determine the resistance of the resistor.

Majority of the candidates connected the circuit diagram correctly and plotted the linear graph using the points of best fit.

QUESTION 2

AIM: To determine the resistance of a resistor using power-current relationship.

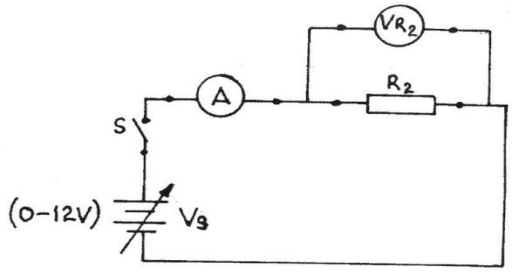


Figure 2

Table 2

V_S (V)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	8.0
Current (mA)								
Voltage (VR_1)								
Power W(IVR_2)								
I^2								

(a) Connect the circuit as shown in Figure 2.
(b) Ask the supervisor to check the circuit connection.
(c) Copy Table 2 into your answer booklet.
(d) Switch on the power supply unit.
(e) Set the power supply unit to 0 V and close the switch (S).
(f) Read and record the corresponding ammeter and voltmeter readings.
(g) Repeat steps (e) and (f) for the other values in Table 2.
(h) Open switch (S) and switch off the power supply unit.
(i) Complete Table 2.
(j) Calculate the slope of the graph.
(k) Determine the resistance of the resistor.

Candidates were to determine the resistance value of resistor using power-current relationship. Candidates were able to calculate the slope of the graph and determine the resistance of the resistor.

Majority of the candidates connected the circuit diagram and with the given input voltages were able to determine the currents and voltages respectively. Candidates were able to calculate the slope of the graph and determine the resistance of the resistor.

Candidates' performance was generally good.

AUTO MECHANICS 2

1. GENERAL COMMENTS

The standard of the paper compares favourably with that of the previous year's. Candidates' performance was average.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Candidates gave good responses to the causes of spongy brake pedals.
(2) Many candidates were able to identify the wiring system and gave correct names to its parts.
(3) Stating water-cooling system faults was well answered by most candidates.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

Weaknesses observed were as follows:
(1) Poor articulation of ideas in written form.
(2) Ideas were hazy and incoherent.
(3) Many spelling mistakes were observed.
(4) Sketches demanded were poorly produced.

4. SUGGESTED REMEDIES

(1) Candidates should change their attitude towards the subject. It seems there is a general indifference on the part of candidates towards the subject.
(2) School heads and teachers must all work together to salvage the subject from the current downward trend.

5. DETAILED COMMENTS

QUESTION 1

(a) With the aid of a sketch, explain the leading and trailing brake shoe arrangement.
(b) State one reason why the leading and trailing brake shoe arrangement is often used on rear wheels.
(c) State two causes of a spongy brake pedal.

(a) The question required candidates to sketch and explain the leading and trailing brake shoe arrangement. Most of the sketches drawn had their linings far from the drum making the sketches unfunctionable.
Most sketches drawn by candidates were without the Direction of Rotation (D.O.R.). Without the DOR one cannot determine which shoe is leading or trailing.
(b) Candidates were to state one reason why the trailing and leading shoe arrangement is often used on the rear axle.

A lot of funny reasons were given such as to prevent brake fade and to carry more load at the rear.

The reason is, it provides efficient braking when the vehicle is reversing. In this case the leading shoe becomes a trailing shoe and the trailing becomes a leading one with a change in the Direction of Rotation.

(c) The response by candidates to this question requiring candidates to state two causes of brake pedal was positive. Some good answers given include: low level of fluid, linings not properly fixed, and leakage or air in the system.

QUESTION 2

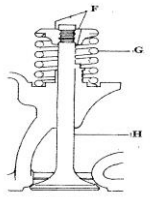


Figure 1

(a) (i) Identify the parts of the sketch labelled F, G and H.
(ii) State one function each of the parts labelled F, G and H.
(b) State three maintenance practices given to the part labelled H in Figure I during decarbonizing.

(a) Answers given by candidates for the function of each of the identified parts were not satisfactory.

The function of the parts labelled were

F (collet)	- It secures the valve springs to the valve
G (valve spring)	- It allows the valve to close properly thus providing a good seal
H (valve stem)	- It permits the inflow of fresh charge into the engine or permits the escape of burnt gases out of the engine

(b) Because most of the candidates did not have any attachment to industry, they found it difficult to answer this practical question.

In carrying out maintenance for a valve, during decarbonizing some of the following are done:

- check the valve for carbon deposit and remove
- clean or wash the valve
- check valve for straightness
- check valve surface for burn, wear and pitting

- grind and lap the valve
- test value for correct seating

QUESTION 3

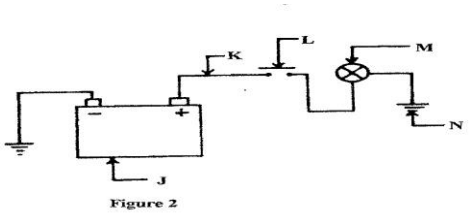


Figure 2

(a) (i) Identify the type of wiring shown in the sketch in Figure 2.
(ii) Name the parts of the sketch labelled J, K, L, M and N in Figure 2.

(b) State the purpose of the parts of the sketch labelled K, L and M in Figure 2.
(c) State what (-) and (+) represent in the sketch in Figure 2.

(a) (i) In identifying the wiring system, answers given by some of the candidates were quite good, but others were poor. Correct answers which were accepted, include, negative earth return system, series connection and a lighting circuit.

(ii) Candidates were to identify the parts labelled J, K, L, M and N. Most of the candidates did well except a few who could not fully identify some of the parts.

The parts to be identified are:
J - battery
K - cable or wire
L - lighting switch
M - bulb or lamp
N - earth or chassis

(b) Candidates were to state the purpose of the parts K, L and M. Their performance was quite good.

K - Battery cable is to connect the battery to the switch or transfer current from the battery to the components or resistors.
L - Switch - its purpose is to connect and disconnect the circuit or controls the flow of current in the circuit.
M - Bulb - its purpose is to convert electrical current into light energy or it gives vision to the driver in the darkness or it illuminates both internal and external environment.

(c) This was the most popular question which was answered correctly by most of the candidates. Candidates were to interpret the battery symbols of (+) and (-).
(+) represents positive post or terminal of the battery and
(-) represents negative post or terminal of the battery

QUESTION 4

(a) State five water-cooling system faults that can cause engine overheating.
(b) State two merits of air-cooled engine.

(c) State one function each of the following cooling system parts:
(i) impeller;
(ii) fan;
(iii) fins.

(a) A good number of candidates did well with this part of the question. Answers given include:

- shortage of coolant
- leakage from radiator
- faulty thermostat
- faulty pressure cap
- faulty water pump
- blocked radiator
- broken fan blades

(b) This question required candidates to state two merits of an air-cooled engine. The response to this question was also good. Candidates stated among others the following:

- it does not require topping up of water
- leakage problems are absent
- engine warms up quickly
- easier to maintain
- absence of radiator provides more space

(c) Impeller - It accelerates the speed of water through the cooling system.
Fins - Fins provide the needed surface area for effective cooling through radiation on the air cooled engine.
Fan - It draws air through the radiator fins when engine is idling or stationary

QUESTION 5

(a) Define the term chassis frame.

(b) Sketch the transmission layout of a conventional motor vehicle and label the following parts:

(i) gearbox;

(ii) propeller shaft;

(iii) rear axle;

(iv) clutch.

(c) Explain why the chassis frame is narrowed at the front and upswept at the rear.

(d) State one advantage of a rear engine, rear wheel drive vehicle.

(a) Candidates who answered this question did well. A chassis frame is the skeletal frame of the vehicle on which all the major components are mounted.

(b) A few of the candidates produced good and functionable sketches whilst the majority presented haphazard sketches.

(c) Only a few candidates responded correctly while majority showed lack of knowledge. Some incorrect answers include 'it is narrowed at the front to enable the driver to see properly and upswept to enable the rear carry much load'.

The frame is narrowed at the front to provide a wider steering lock and upswept at the rear to make room for vertical movement of the axle.

(d) Candidates were to state one advantage of a rear engine, rear wheel drive car. Answers provided were not good enough. Advantages of rear engine, rear wheel drive includes: lower centre of gravity, very compact body; fumes and noise are behind passengers; excellent traction when climbing a hill, more room for passengers' legs.

Candidates performance on the whole was an average.

AUTO MECHANICS 3

1. GENERAL COMMENTS

The paper compared favourably with those of previous years. Candidates' performance improved slightly over that of the previous year.

2. A SUMMARY OF CANDIDATES' STRENGTHS

Strengths exhibited by candidates in the performance of their tasks included the following:
(1) Candidates turned up on time and were neatly dressed in their safety gears.
(2) Candidates displayed confidence in their approach to the various tasks.
(3) Most candidates approached their tasks systematically.
(4) Selection of tools was done without much trial and error.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

The poor performances of candidates were noticed during the task workout as follows:
(1) Candidates had some difficulty in using the ring expander and piston ring clamp.
(2) Removal of compression ring from the piston and fitting it and checking of the working gap were difficult tasks.
(3) Some candidates could not identify the difference between the clutch master cylinder and the brake master cylinder.

4. SUGGESTED REMEDIES

(1) Candidates should attach more seriousness to the study of Auto Mechanics by reading textbooks and doing a lot of practical exercises.
(2) Teachers must help candidates during practical lessons to identify all the parts related to the vehicle components.
(3) Students should be introduced to faulty parts and components to be familiar with them.
(4) Industrial attachment of candidates to motor firms must be pursued for students to acquire practical training during vacation.

5. DETAILED COMMENTS

QUESTION 1

From the cylinder block assembly provided:
(a) remove the oil sump. Report to the examiner;
(b) remove the piston assembly. Report to the examiner;
(c) examine the cylinder bore for wear. Report to the examiner;
(d) remove a compression ring from the piston. Report to the examiner;
(e) check the working gap. Report to the examiner;
(f) refit the compression ring. Report to the examiner;
(g) refit the piston into the bore. Report to the examiner;
(h) refit the oil sump. Report to the examiner.

(a) Candidates were expected to remove and install oil sump without damaging sump gasket. The sump is removed by the slackening and removal of bolts securing it in position and tapping it.

Many candidates did well in this task. Some candidates failed to slacken for removal of bolts.

(b) A number of candidates found it difficult to tap the connecting rod to push the piston out from the cylinder bore. Performance was average.

(c) In the examination of cylinder bore for wear, candidates were to know the degree to which the bore was worn. Candidates managed to give reasonable answers.

(d) Candidates should have mastered the removal of the piston rings without breaking it. Candidates' performance was good.

(e) The practice of checking the piston ring working gap is to determine the correct piston diameter with its rings to be used. Performance of this task was poor. In checking, the ring should be inserted into the cylinder and the piston used to square it into the cylinder before the ring gap is measured.

(f) In refitting of the compression ring, the usage of the piston ring expander was tested. Performance was average.

(g)&(h) In refitting the piston into the bore, candidates were tested on how to arrange the ring gab on the piston to limit the blow-by gas into the sump. To fix the sump without oil leakage. Candidates had little knowledge of this.

QUESTION 2

From the clutch master cylinder assembly provided:
(a) dismantle the cylinder. Report to the examiner;
(b) identify three parts indicated by the examiner;
(c) examine the condition of the identified parts. Report to the examiner;
(d) answer two relevant questions from the examiner;
(e) reassemble the clutch master cylinder. Report to the examiner;
(f) test master cylinder for functionality. Report to the examiner.

(a) Candidates had to secure the master cylinder to the vice. Performance was poor.

(b) Candidates were to know the names of the parts and their working principles. Performance was average.

(c) An average performance was realised in the examination of the conditions to know the difference between good and bad parts.

(d) Some of the parts indicated by the examiner are the check valve assembly, spring retainer, main seal and reservoir. Wrong answers such as fuel tank, rubbers and piston were given.

(e) The question tested the level of the candidate's skill on the clutch master cylinder including the ability to diagnose a fault on the clutch master cylinder. Candidate's performance was good.

(f) After the assembling, the candidates tested the master cylinder for functionality. The general performance of candidates was average.

BUILDING CONSTRUCTION 2

1. GENERAL COMMENTS

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

2. A SUMMARY OF CANDIDATES' STRENGTHS

Candidates' strengths include:

(i) Most candidates produced good sketches of tools they were asked to sketch.
(ii) Majority of candidates presented their work orderly.
(iii) Most candidates' handwritings were very neat and legible.
(iv) Most candidates properly numbered their work.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

Candidates' weaknesses include:

(i) Some candidates answered only two questions instead of the four demanded by the rubrics.
(ii) Most candidates could not answer questions (4) and (5) correctly.
(iii) Most candidates' responses showed inadequate preparation towards the examination.

4. SUGGESTED REMEDIES

(i) Teachers should endeavour to cover the syllabus before students sit for the examinations.
(ii) Teachers should prepare candidates thoroughly by taking them through how to answer questions.
(iii) Candidates should take their preparation towards examinations very serious and commit time towards their studies.

5. DETAILED COMMENTS

QUESTION 1

(a) List two members in each of the following construction teams:
- **(i) builder's team;**
- **(ii) client's team;**
- **(iii) statutory personnel.**

(b) State two purposes of a strip foundation.

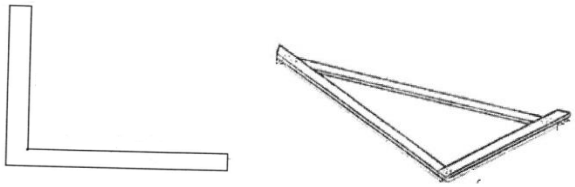
(c) Sketch each of the following types of setting-out tools:
- **(i) builder's square;**
- **(ii) club hammer.**

(a) Most candidates were able to list the two members from the builders' and clients teams. Most candidates however, gave wrong responses to the statutory personnel. The required answers include: building inspector, town planner, city engineer, fire officer, etc. Statutory personnel are mandated by law to play individual or collective roles in the building industry.

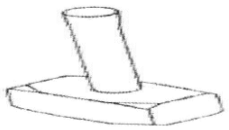
(b) Majority of candidates could not state the two purposes of a strip foundation. Most candidates rather stated the type of soil suitable for a strip foundation. The required answers include:
- to provide support for the walls of the building;
- to provide supports for columns;
- serves as the base for the walls.

(c) Most candidates produced very good sketches of the builders' square. The club hammer was, however, not properly sketched. Most candidates rather sketched the claw hammer.

(i) Builder's square



(ii) Club hammer



QUESTION 2

(a) (i) List two utility services required on a construction site:
(ii) State one reason for each of the services mentioned in (a)(i).
(b) State one safety measure each to be observed on site when:
(i) excavating deep foundation trenches manually;
(ii) erecting metal scaffold;
(iii) using a concrete mixer.
(c) What is meant by the term site clearing?

(a) Majority of candidates were able to answer this question satisfactorily.

(b) Most of the answers given by candidates centred on personal safety. The required answers include:
(i) - keeping heavy equipment away from trench edges;
- battering the sides of the trenches.

(ii) - using sound materials for the construction;
- provision of guard rails.

(iii) - the mixer should be inspected before use;
- it should not be used in a wet location but on a hard surface.

QUESTION 3

(a) State three desirable properties of hardened concrete.
(b) State three functions of an internal wall.
(c) State the reason for providing a landing in stair construction.

(a) Most candidates stated the desirable properties of hardened concrete.

The required answers include:
- durability; - resistant to friction;
- required strength; - impermeable to water.

(b) Majority of candidates were able to state the three functions of an internal wall.

(c) Most candidates satisfactorily answered this question. Equally good answers that were not mentioned by candidates are:

- to break up the span;
- to permit safe passage of flight of stairs.

QUESTION 4

(a) State the difference between a communication pipe and service pipe in cold water supply system.
(b) Sketch a cross-section through a soakaway pit with gravel filing.
(c) Sketch each of the following electrical symbols:
(i) bell;
(ii) two-way switch;
(iii) socket outlet.
(d) List two finishes that are applied to the internal surfaces of a sandcrete blockwall.

(a) Most candidates could not differentiate between a communication pipe and a service pipe in a cold water supply system.

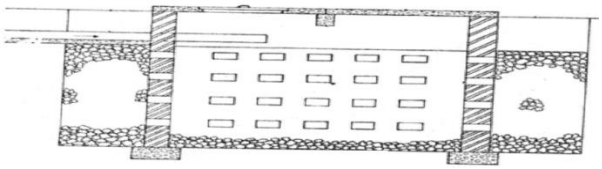
The required answer is:

Communication pipe is the part of service pipe vested in the water company while service pipe is a pipe which is directly subjected to pressure from a main, sometimes called the rising main, inside the building.

(b) Most candidates could not sketch a cross-section through a soakaway pit as demanded by the question. However, candidates who attempted this question made

good of lined soakaway pit but failed to indicate the stones or boulders in the pit. Cover for the pit was also omitted.

Sketch of cross-section through a soak away pit



(c) Most candidates could not sketch the representative symbol for bell but provided the correct symbols for the two-way switch and the socket outlet.

Sketch of Electrical Symbols

(d) Majority of candidates were able to answer this question very well. A few however, mentioned finishes for external walls instead of the internal wall. The required answers include: plaster, wall paper hanging, panelling, etc.

QUESTION 5

(a) State two functions of road kerb.
(b) State two desirable properties of a material used for the construction of a pedestrian walkway.

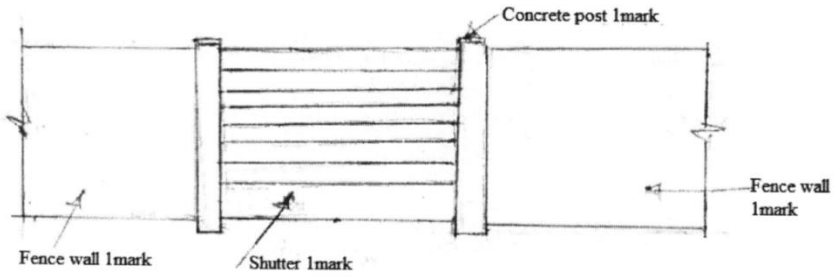
(c) Sketch the elevation of steel gate in a fence wall and label the following parts:
(i) shutter;
(ii) concrete post;
(iii) fence wall.

(a) A few candidates were able to answer this question correctly. The required answers include:

- it defines the road limit;
- it prevents erosion on the sides of the road;
- it defines pedestrian walkways.

(b) Most candidates were able to answer this question very well.

(c) Most candidates were not able to answer this question at all. The few who attempted rather sketched panel door or flush door in place of the shutter. The required sketch is shown below:


Concrete post 1mark
Fence wall
1mark
Fence wall 1mark
Shutter 1mark

BUILDING CONSTRUCTION 3

1. GENERAL COMMENTS

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

Candidates' performance was satisfactory.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Most candidates arranged and presented their work well.
(2) Most candidates numbered their answers neatly.
(3) Majority of candidates produced proportional and legible sketches.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Candidates could not use technical expressions, jargons or terms of the subject in answering questions.
(2) The orientation of arrows for labelling were not properly done.
(3) Most candidates' handwriting were not legible enough for easy reading.

4. SUGGESTED REMEDIES

(1) Candidates should read technical related textbooks, journals and handouts to be abreast with technical terms and jargons.
(2) Candidates should endeavour to take their Technical Drawing lessons seriously and transfer acquired knowledge to other subjects.
(3) Candidates should make conscious efforts to improve upon their handwriting.

5. DETAILED COMMENTS

QUESTION 1

Fig. 1 shows a sectional drawing through a proposed two-storey structure. The walls are made of 225 mm thick sandcrete block and the roof is a reinforced concrete slab. The building has a dog-leg stair. Use it to answer question 1.

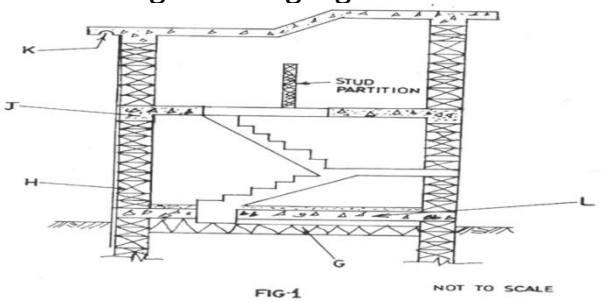


FIG-1 NOT TO SCALE

(a) (i) Identify the elements labelled G, H and L.
(ii) State the purpose for providing the elements J and K.

(b) List six machines the contractor will require to clear the site and cart away cleared materials.

(c) Sketch an ordinary strip foundation for the building and label the following parts:

(i) strip foundation;
(ii) sandcrete blockwall;
(iii) finished ground level;
(iv) back fill.

(d) Sketch the plan of the dog-leg stair and label the following parts:

(i) tread;
(ii) half-turn landing;
(iii) newel post;
(iv) stair well.

(e) State three processes required to cast an ordinary strip foundation for the building using ready mixed concrete.

(a) (i) Most of the candidates were able to answer this question satisfactorily. A few however, could not identify the appropriate elements.

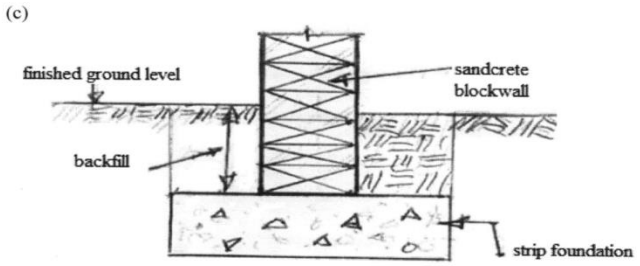
The required responses are:
G - hardcore
H - sandcrete block wall
L - concrete ground floor/ground floor slab

(ii) Most candidates were able to state the purpose of element K (throating) but could not do same for element J (edge floor beam).

The edge floor beam is used to tie the walls together and distribute the floor loads to the wall.

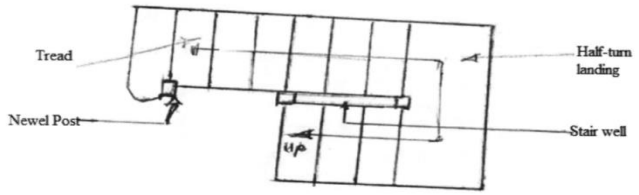
(b) Majority of candidates listed very good answers to this question. A few however, listed cutlasses, hoes, etc. The answers are: bulldozer, grader, dumper, pay loader, etc.

(c) Most candidates produced good sketches, but the trench edges were left out and labelling of parts were misplaced by many candidates.



(d) Most candidates' sketches were encouraging. A few however, produced sectional views instead of the plan.

(d) **Sketch of the plan of the dog-leg stair:**



(e) Most of the candidates could not answer this question very well. The processes involved are:

- prepare the bottom of the trench excavation and peg to receive the concrete;
- place the concrete;
- cure and protect the placed concrete against damage.

QUESTION 2

(a) List four materials used for constructing an access road to a building site.
(b) State four precautions to be taken when excavating a foundation trench.
(c) State four factors to be considered when choosing a type of foundation for a domestic building.

(a)&(b) These questions were very well answered by many candidates.

(c) Most of the candidates answered this question satisfactorily. However, equally important answers were not stated at all.

They are

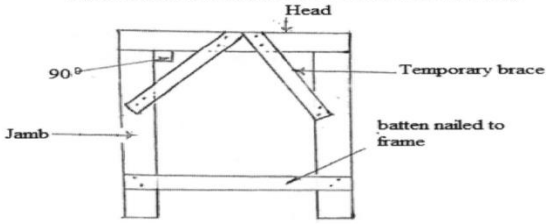
- the topography of the ground;
- geographical location.

QUESTION 3

(a) Sketch a wooden door frame and label the following:
(i) jamb;
(ii) head;
(iii) temporary brace.
(b) List the stages involved in the manufacture of a landcrete block when the soil material and the cement are available at the site.
(c) List six parts of a wooden formwork for supporting an isolated in-situ concrete beam.

(a) Most candidates deviated and sketched a ledged door. The required sketch is shown below:

(a) **Sketch of a wooden door frame and labelling:**



(b) Majority of candidates who attempted this question did not provide all the stages involved.

The stages are:
- screen soil material to remove lumps;
- batch the material (soil and cement);
- mix soil and cement to a uniform consistency;
- add water to the soil-cement mix;
- clean and moisten the internal surfaces of the mould box;
- fill the mould box with the mix and compact;
- remove the moulded block and allow to cure under shed;
- stack the blocks under shed and protect against damage.

(c) Candidates answered this question very well.

QUESTION 4

(a) State three reasons for using a reinforced concrete stair instead of a timber stair in a public building.

(b) Sketch to show how a wooden window frame is fixed into an opening in a sandcrete blockwall.

(c) Explain the function of each of the following in relation to roof construction:
- **(i) corrugated roofing sheets;**
- **(ii) purlin;**
- **(iii) rafter;**
- **(v) eaves gutter.**

(a) Majority of candidates stated the reasons very well.

(b) The sketch of the wood frame inserted into the wall in elevation were produced alright by most candidates, but majority left out the logs for the anchorage.

(c) Candidates produced the right answers.

QUESTION 5

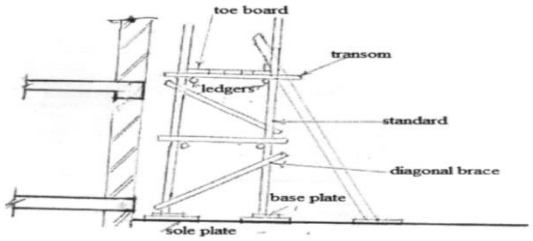
(a) List five desirable properties of timber used in the construction of a building.
(b) Sketch an independent scaffold and label the following parts:
- **(i) standard;**
- **(ii) sole plate;**
- **(iii) ledger;**
- **(iv) transome.**

(c) State three precautions to be taken before the commencement of a demolition work on a building.

(a) Candidates who answered this question produced satisfactory work.

(b) Most of the candidates produced very poor sketches which were not labelled.

Sketch of an Independent Scaffold:



(c) Candidates showed no knowledge or little knowledge in this question. The required answers include:

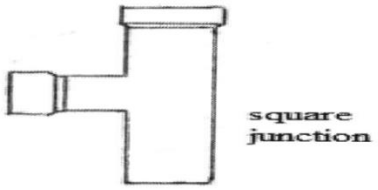
- hoarding of property for demolition works;
- inspection of the structure to be demolished;
- documentation of defects on adjacent properties with photographs;
- warnings to owners/occupants of adjacent properties.

QUESTION 6

(a) (i) Sketch a single square junction used in a drain line.
(ii) State three reasons for providing a manhole in a drainage scheme.
(b) State three reasons for using ebonite strip in a terrazzo floor finish.
(c) Explain the role of each of the following in an electrical installation works:
- **(i) fuse wire;**
- **(ii) earthing rod.**

The whole of question 6 was not properly answered by the candidates. The responses required are

(a) (i) A Sketch of a single square junction used in a drainage line



(ii) Manhole is used in a drainage system to provide access for: inspection, testing, cleaning, general maintenance, etc.

(b)
- to divide the floor area into workable bays;
- to ensure ease of maintenance;
- provide pleasing appearance.

(c) (i) Fuse Wire: controls the flow of excess current by breaking off.

(ii) Earthing rod: ensures that a stagnant current load is carried away into the earth.

ELECTRONICS 2

1. GENERAL COMMENTS

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

Performance of the candidates compared with that of the previous year was at par.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Some of the candidates have in-depth knowledge about impedance and current in an RLC circuit.
(2) Some candidates were able to distinguish between a forward biased and reverse biased diodes in a circuit.
(3) Some of the candidates had fair knowledge of the truth table of logic gates.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Most candidates exhibited weakness in the definition of laws.
(2) Some candidates had difficulty in identifying controls of an oscilloscope.
(3) Most candidates lacked knowledge about the application of electromagnetic principles.
(4) Most of the candidates did not prepare adequately for the examination.

4. SUGGESTED REMEDIES

(1) Candidates should prepare adequately for the examination.
(2) Candidates should be taught the techniques of answering questions.
(3) Candidates should read widely on electronic textbooks to broaden their knowledge in the subject.
(4) Some of the recommended textbooks should be made available to candidates.

5. DETAILED COMMENTS

QUESTION 1

(a) State the function of the following controls of an oscilloscope:
(i) focus control;
(ii) intensity control;
(iii) Y position control.
(b) List two:
(i) mechanical parts of a moving coil instrument;
(ii) controls on a signal generator.

(a) Candidates' response to the question was very poor as majority of the candidates exhibited lack of knowledge of the function of the controls of an oscilloscope.

(i) Focus control is to sharpen the horizontal trace on the screen.
(ii) Intensity control is to increase or decrease the brightness of the trace.
(iii) Y position control is move the trace up or down vertically.

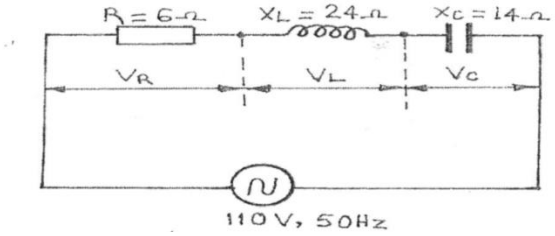
(b) (i) Most of the candidates were able to list two parts of a moving coil instrument. Candidates' response was very good.

(ii) Candidates' performance was poor as most of the candidates failed to list two controls on a signal generator correctly.

Controls on a signal generator
- frequency control
- magnitude setting
- wave from selecting control
- DC offset
- duty cycle control

QUESTION 2

Figure 1 is series RLC circuit.



Calculate the:
(a) impedance;
(b) current;
(c) power dissipated in the circuit;
(d) power factor.

(a) Majority of candidates were able to calculate the impedance of the circuit. The overall response to the question was very good.

(b) Candidates' response to the question was equally good as most candidates were able to calculate the circuit current correctly.

(c) Majority of candidates failed to apply the correct formula to calculate the power dissipated in the circuit. Candidates' performance was very poor.

Power (P) $= I^2R$
$= (9.43)^2 \times 6$
P $= 533.55$ W

(d) Similarly, candidates' performance was very poor as only a few were able to calculate the power factor.

Real power = IV Cosθ

$\therefore Cos\theta = \frac{P}{IV}$ *or* $Cos\theta = \frac{P}{z}$

$= \frac{533.55}{9.43x110}$ *or* $= \frac{6}{11.66}$

Cosθ = 0.514 (lagging)

QUESTION 3

(a) Define:
- **(i) doping with respect to semiconductors;**
- **(ii) peak inverse voltage of a diode.**

(b) List one example each of
- **(i) trivalent material;**
- **(ii) pentavalent material.**

(c) Draw the circuit diagram of a p-n junction diode in a
- **(i) forward biased mode;**
- **(ii) reversed biased mode.**

(a) (i) Many of the candidates were able to define doping correctly. However, some of them did not live up to expectation. Candidates' performance was good.

(ii) Majority of the candidates could not define peak inverse voltage of a diode. Candidates' performance was very poor.

Peak inverse voltage of a diode is the maximum voltage that the diode can withstand under reverse bias condition without breakdown.

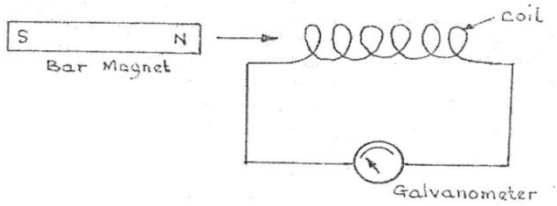
(b) (i)&(ii) Many candidates could not list one example each of both trivalent and pentavalent materials respectfully. Candidates' performance was poor.

Examples of trivalent material:
- Boron
- Indium
- Gallium

QUESTION 4

(a) Define the term mutual inductance.

Figure 2 is an illustration of interaction between a magnet and a coil.



(b) State two:
(i) factors that determine the quality of e.m.f. read by the galvanometer;
(ii) applications of the principle illustrated in Figure 2.

(a) Majority of candidates could not define the term mutual inductance correctly. Candidates' performance was very poor.

Mutual inductance is defined as a measure of the ability of change of flux (current) in one coil to induce voltage in the adjacent coil.

(b) (i) Many candidates could not state two factors that determine the quality of e.m.f. read by the galvanometer. Candidates' performance was poor.

Factors that determine the quantity of e.m.f. read by galvanometer:
- Relative speed of the magnet
- Number of turns of coil
- Direction of motion of the magnet
- Rate of change of flux linkage

(ii) Similarly, many candidates could not state two applications of the principles illustrated in fig. 2. Candidates' performance was poor.

Applications of principle illustrated in figure 2:
- Electric generator
- Relay
- Electric bell
- Loudspeaker

QUESTION 5

(a) State the two types of push-pull amplifiers.
(b) Draw the circuit diagram of a common-emitter amplifier using voltage divider bias, showing the input and output waveforms.
(c) List two applications of operational amplifiers.

(a) This question was not popular among candidates. Majority of candidates could not state two types of push-pull amplifiers. Candidates' performance was very poor.

- Matched pairs
- Complementary pairs

(b) Majority of candidates could not draw the circuit diagram of a common-emitter amplifier using voltage divider bias. However, some were able to draw the circuit correctly. Candidates' performance was fair.

(c)

QUESTION 6

(a) Define amplitude modulation.
(b) State
(i) two types of radio receivers;
(ii) three advantages of frequency modulation over amplitude modulation.

(a) Majority of candidates could not define amplitude modulation correctly. The overall performance of candidates was poor.

Amplitude modulation is the process of varying the amplitude of a high frequency carrier in proportion to a modulating signal.

(b) (i) Majority of candidates were able to state only one type of radio receiver instead of two. Candidates' performance was fair.

- Tuned radio frequency
- Superheterodyne receiver

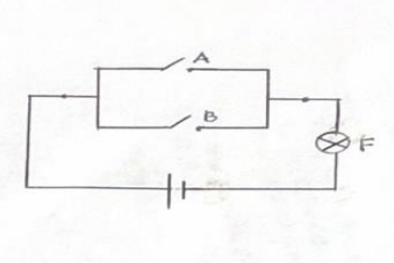
(ii) Majority of candidates could not state three advantages of frequency modulation over amplitude modulation. The overall response to the question was very poor.
- Better noise immunity
- Better sound quality
- Improved signal to noise ratio

QUESTION 7

(a) **Define an OR logic gate.**
(b) **Draw the mechanical switching implementation of two input OR logic gate indicating the input and output.**
(c) **Draw the truth table for two input OR logic gate.**

(a) This question was not popular among candidates. Majority of candidates could not define an OR logic gate correctly. The overall performance of candidates was poor.

(b) Some candidates were able to draw the mechanical switching arrangement of the two-input OR logic gate. The overall performance of candidates was fair.



An OR logic gate

(c) This question was popular amongst candidates. Majority of candidates could draw the truth table for the two input OR logic gate. Candidates' performance was very good.

ELECTRONICS 3

1. GENERAL COMMENTS

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

Performance of the candidates compared with that of the previous year was at par.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Majority of the candidates understood the circuit diagrams and successfully performed the two experiments.
(2) Values obtained by most of the candidates were accurate making them draw good graphs.
(3) Candidates must be commended for the good work done.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Few candidates lacked the understanding of ammeter readings and calibrations.
(2) Some of the candidates could not calculate the voltage drops across the resistors as demanded in the question.
(3) Most of the candidates were not able to compare the ratio $\frac{R_2}{R_3}$ with the slope of the graph.

4. SUGGESTED REMEDIES

(1) Candidates should be encouraged to take their elective subjects seriously.
(2) The uses of the instruments and their care should be well handled by the teachers.
(3) Candidates should be encouraged to use correct formulae for their calculations.

5. DETAILED COMMENTS

Candidates were provided with the following apparatus:
one d.c. variable power supply unit (0-12 V);
one multimeter;
two milliameters (0 – 10 mA);
one 100 Ω, ¼ W resistor;
two 1 k**Ω, ¼ W resistors;**
two 2.2 k**Ω, ¼ W resistors;**
one 3.3 k**Ω, ¼ W resistor;**
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 investigate a voltage divider network circuit.

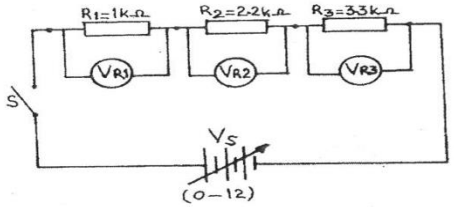


Figure 1

(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

$V_S(V)$	$V_{R1}(V)$	$V_{R2}(V)$	$V_{R3}(V)$	$\left[\frac{R_1}{R_1+R_2+R_3}\right]^{V_S}$	$\left[\frac{R_2}{R_1+R_2+R_3}\right]^{V_S}$	$\left[\frac{R_3}{R_1+R_2+R_3}\right]^{V_S}$
2						
4						
6						
8						
10						

(d) Set the power supply unit to 0 V.
(e) Close switch (S).
(f) Adjust the power supply unit to 2 V.
(g) Measure and record in Table 1, the voltmeter readings (V_{R1}), (V_{R2}) and (V_{R3}) respectively.
(h) Open switch (S).
(i) Repeat steps (e) to (h) for the other values of V_S in Table 1.
(j) Complete Table 1.
(k) Compare the measured values (V_{R1}), (V_{R2}) and (V_{R3}) with the calculated values.

The experiment tested the voltage drops across three (3) resistors connected in series.

Majority of the candidates obtained good results.

Performance was generally very good.

QUESTION 2

AIM: To investigate current divider network circuit.

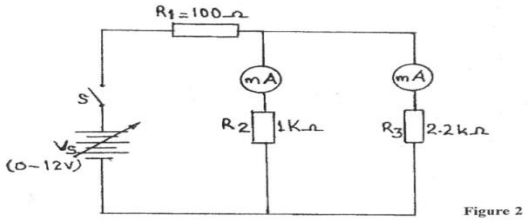


Figure 2

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

Table 2

V_S(V)	I_{R2}(mA)	I_{R3}(mA)
2		
4		
6		
8		
10		

(d) Set the power supply unit to 0 V.
(e) Close switch (S).
(f) Adjust the power supply unit to 2 V.
(g) Read and record in Table 2, the ammeter readings (I_{R2}) and (I_{R3})
(h) Open switch (S).
(i) Repeat steps (e) to (h) for the other values of (V_S) in Table 2.
(j) Plot a graph of I_{R3}(mA) on the vertical axis against I_{R2}(mA) on the horizontal axis.
(k) Determine the slope of the graph.
(l) Compare the ratio $\frac{R_2}{R_3}$ with the slope.

Majority of candidates obtained good results and were able to use the results to draw good graphs. However, they could not compare the ratio $\frac{R_2}{R_3}$ with the slopes.

Performance of the candidates was generally good.

INFORMATION AND COMMUNICATIONS TECHNOLOGY (ELECTIVE) 2

1. GENERAL COMMENTS

The standard of the paper compared favorably with that of the previous years in terms of content and level of difficulty.

The paper was well set and within the reach of the candidates and the general performance was better than the previous year.

2. SUMMARY OF CANDIDATES' STRENGTHS

(1) Most of the candidates answered the questions as demanded by the rubrics.
(2) A good number of the candidates exhibited good knowledge of the subject matter.
(3) A greater number of the candidates expressed themselves much better in the English Language than had been the practice in previous years.

3. SUMMARY OF CANDIDATES' WEAKNESSES

(1) Some of the candidates did not understand the key requirements of the questions.
(2) Poor structure of the answers provided by most candidates.
(3) Poor presentation skills exhibited by most of the candidates.
(4) Some of the candidates had poor handwriting.
(5) Some of the candidates demonstrated in their answers that they had little or no knowledge of the examination syllabus.

4. SUGGESTED REMEDIES

(1) Candidates should carefully read through the questions, select those to be attempted and plan the answers well before writing them out.
(2) Candidates should use the recommended textbooks and material on ICT and carefully use the Internet as a learning tool.
(3) Candidates should allow for time to read through their answers to correct any errors as well as add further details.
(4) Teachers of the ICT Elective subject should learn to adhere to the syllabus as much as possible.

5. DETAILED COMMENTS

QUESTION 1

(a) What is an *information system?*
(b) Describe *two* factors that may influence the matching of an information system to the organization information requirement.

(a) Most of the candidates used the systems concept to describe an information system as if it was a mere system.

Candidates were expected to write that an information system is any formalised set of procedures that is capable of accepting data or information from any source, processing these data or information, and making the results available to users.

(b) Most of the candidates were just listing other types of information systems, e.g. such as management information system, decision support system, etc., as the response to the question.

This question attracted the worst answers.

The expected solution is:

(1) **The importance of a dynamic environmental response to the organization.**
The need for management to have information readily available for use anytime any of the environmental factors change and the organization has to react or adapt to the change.

(2) **The management style of the firm.**
If it is the directive style, information should be made available only to those who need it. While for the participative style, anyone who needs some information should have ready access to it.

(3) **The information intensity of the operations of the business.**
The intensity is low if managers do not need too much information to enable them carry out their functions. In such a situation, the information system should not provide more information than is necessary in order to prevent information overload with its attendant high cost.

Where the intensity is high, all the information needed should be provided, else the decisions made will be unduly affected.

(4) **The organizational structure.**
The structure of the organization will have an influence on the type and volume of information required and, therefore, provided by the information system.

QUESTION 2

(a) Describe the *motherboard* of a computer.
(b) (i) What is a *computer port*?
(ii) List *two* computer ports.

Good knowledge of the subject matter was exhibited by most of the candidates who answered this question.

The required is as solution follows:

(a) The motherboard, also called the system board, is the main circuit board in the system unit. It consists of a flat board that fills the bottom of the system unit. This board contains the brain of the computer called the central processing unit, the main memory (random access memory)/(memory bank) that assists the central processing unit, in addition to some sockets called expansion slots into which additional circuit boards (called expansion boards) may be plugged.

(b) (i) A computer port is a socket on the outside of the system unit that is connected to the motherboard on the inside of the system unit. It allows users to connect devices such as a monitor, printer, modem, etc. so that it can communicate with the computer.

(ii) **Computer ports include:**

(1) Serial port
(2) Parallel port
(3) Game port
(4) Video adapter port
(5) SCSI port
(6) Infrared port
(7) USB port
(8) HDMI port
(9) Ethernet/Network port
(10) Power connector port
(11) PS/2 port

QUESTION 3

(a) What is
(i) computer assisted learning (CAL);
(ii) web based learning (WBL)?
(b) State *three* advantages of computer assisted learning over internet-based learning.

This was the worse question answered by most of the candidates after question 1. A greater majority of the candidates failed to realize that they both represent software packages for training and learning but, whereas CAL relies solely on the computer, WBL requires the use of the internet.

The suggested solution is:
(a)
(i) Computer Assisted Learning (CAL) covers a range of computer-based packages which aim to provide interactive instructions usually in a specific subject area and predates the internet.

CAL refers to any use of computers to aid or support the education or training of people.

(ii) Web Based Learning (WBL) covers a range of computer-based packages which aim to provide interactive instructions usually in a specific subject area using the internet.

WBL consists of technologies that support traditional classroom training and online learning environments.

(b)

(i) CAL is run either straight from a CD or floppy disk or over a local network so the constraint of the internet slow download times for multimedia materials may not apply.

(ii) CAL technology has been around a bit longer and thus CAL packages have the potential to offer more advanced, interactive multimedia learning experiences than are currently reasonable to expect from internet-based learning.

(iii) Bandwidth requirements for web technologies are higher and attract higher costs as compared with those for CAL technologies.

(iv) CAL technologies tend to be more readily available than WBL technologies as a result of issues with internet availability.

QUESTION 4

(a) Explain *system software*.
(c) What is an *operating system*?
(d) State *two* functions of an operating system.
(e) List *three* examples of an operating system.

There were a number of good answers to this question. The problem most of the candidates had was treating system software as an operating system. Candidates were required to exhibit knowledge that the operating system is only one programme in the family of the system software.

The expected solution is as follows:

(a) System software is the generic term that refers to programmes developed, tested and sold by software companies and are required by every computer.

System software have to be installed on the computer before any application software can be installed and used on the computer.

Generally, system software control the operations of the hardware and other types of software on the computer.

(b) An operating system is the resident executive software that serves as interface for the computer hardware, users and other elements of application software on the computer.

(c) **Functions of operating system include**:

- Assistance in booting the computer.
- House-keeping functions.
- Management of storage media directories.
- Maintaining a log of usage of the computer.

(d) **Examples of operating system include:**

- Windows 7
- Windows 8
- Windows 10
- Windows NT
- OS/2
- UNIX
- LINUX
- CP/M
- DEC VAX
- DOS
- Mac OSX

QUESTION 5

State, in order, five stages involved in the development of a computer programme.

Generally, most of the candidates had fairly good knowledge of the stages involved in software development. This question attracted good answers from most of the candidates who attempted it.

The suggested solution is as follows:
Stages involved in the development of a computer program are:

1. Define the problem.
2. Design a method of solution using suitable techniques such as pseudocode, flowcharts, or decision tables.
3. Write the programme in a suitable programming language.
4. Test and debug the sub-programmes and the programme as a whole.
5. Document and implement the programme.

INFORMATION AND COMMUNICATIONS TECHNOLOGY (ELECTIVE) 3

1. GENERAL COMMENTS

The standard of the paper compared with that of the previous years. It was noted that, candidates' performance was better than the previous year.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Most of the candidates were able to enter data.
(2) Majority of the candidates were able to code HTML.
(3) Greater number of the candidates were able to create database.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Some of the candidates used Microsoft Excel for the database application instead of Microsoft Access or OpenOffice Base.
(1) HTML files were saved as ". html.html", and ". html.txt" files.
(2) Most of the candidates could not position the SUBMIT button properly on the form for question one (html).
(3) Most of the candidates had difficulty with query creation.
(4) Most of the candidates lack programming skills in QBASIC.

4. SUGGESTED REMEDIES

(1) Teachers must cultivate logical reasoning skills in candidates to help them in the development of programming skills.
(2) Teachers must pay attention to the curriculum requirements. 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.
(4) Teachers must teach the QBASIC programming skills in class with a lot of examples.

5. DETAILED COMMENTS

QUESTION 1

HTML
This question required candidates to create an HTML web page. It required the use of a *Text Editor (**e.g**. Atom, Vim, Notepad, Notepad ++, Brackets, GEdit, etc).*

Most of the candidates used text editors in coding HTML properly.

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>Title of the document</title>
</head>
<body>
The content of the document.....
</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 it will have the title correctly displayed.

The body tag is not part of head tag as some candidates sort to do. Even though an example of indentation has been given in the question, most of the candidates still failed to indent properly. However, indentation has improved this time.

The following explanation shows how to code the HTML question:
The <form> Element
The HTML **<form>** element defines a form that is used to collect user input:
<form>

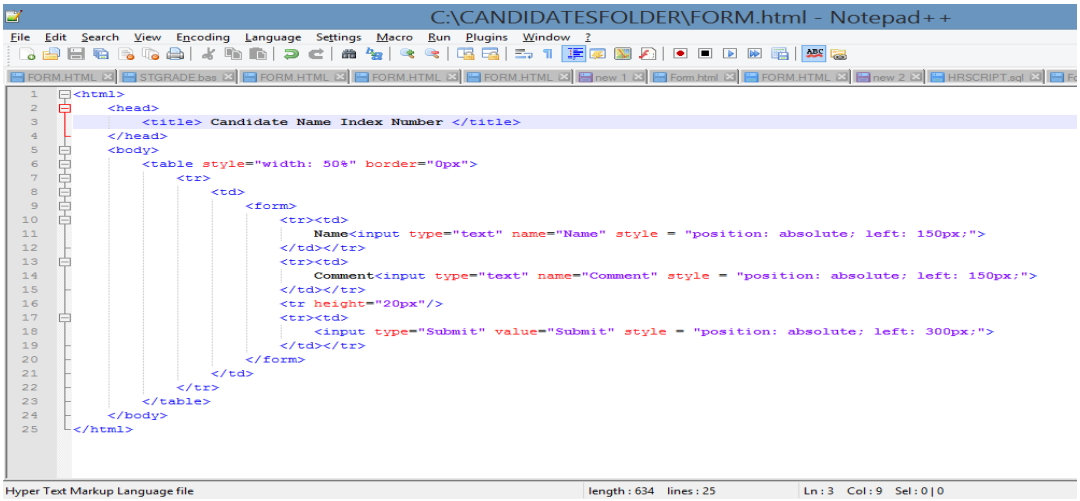
form elements
</form>
An HTML form contains **form elements**.
Form elements have different types of input elements like text fields, checkboxes, radio buttons, submit buttons and more.
The <input> Element
The <input> element can be displayed in several ways depending on the **type** attribute.

Here are some examples:

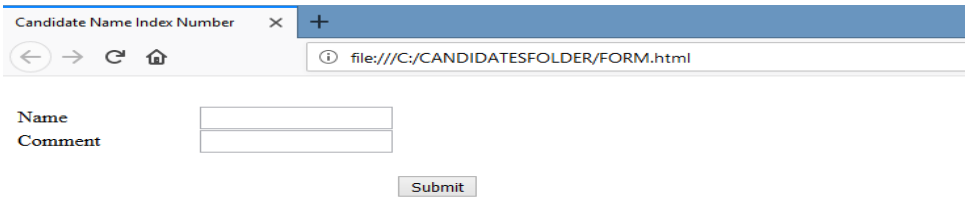
Type	**Description**
<input type="text">	Defines a one-line text input field
<input type="submit">	Defines a submit button (for submitting the form)

Positioning of Element on the form
position: absolute;
An element with position: absolute; is positioned relative to the nearest positioned ancestor (instead of positioned relative to the viewport, like fixed).

However; if an absolute positioned element has no positioned ancestors, it uses the document body, and moves along with page scrolling.
At the completion of the work candidates work will look similar to:



The display for this is as follows:



Some of the candidates coded the HTML files correctly but saved it as text file. The text editor used has a default ".txt" extension. The candidates who did not change the file type to HTML before typing the file name as FORM.HTML will thus end up having the filename after saving to be "FORM.HTML.txt".

QUESTION 2

DATABASE

The requirement is to use a database application to create a database and name it MOCK in the folder created.

The exact naming of the database is critical. Its placement in the folder created is critical. You can manually search for a document on the computer through various techniques even if you forgot the name. However, during the execution of a program, the name and its location must be *exact* otherwise the program cannot find it.

Table 1 is the table provided as data for the work.

LEVEL	ST-ID	MATHS	ENGLISH	FRENCH
1	210097	66	54	46
2	210099	34	55	76
3	210022	88	75	66
2	210077	45	53	55
1	210064	89	55	43

Table 1

(a) **Create**
   (i) **the structure for table 1 using ST_ID as the primary key and save as EXAMS**
   (ii) **A form that will enable users to enter data into EXAMS and save as EFORMS.**

(b) **Use the form in 2(a)(ii) to enter data as shown in table 1.**

(c) **Create a query to sort the table EXAMS by LEVEL and MATHS in ascending order. Save as SRTEXAMS.**

Some of the candidates used LEVEL as the primary key instead of ST_ID. The effect is that the entries in column LEVEL were generated automatically in a sequential order.

As fields set as primary keys does not allow double entries, there is no way that the entries repeated in the LEVEL column could be entered.

Running the required query on **Error! Reference source not found.** will yield wrong results. No changes will be made in the MATHS column after running the query as expected.

The query requires that the entire table be sorted first by LEVEL in ascending order, and then by MATHS in ascending order,

Defining the fields appropriately implies that the field names must be correct and their data types and data size must be correct. A table with a wrong field data type is not a correct table.

Some of the candidates defined all fields as type *Text.* This is not correct in some instances.

QUESTION 3

There was a much improved attempt on the QBASIC question. That notwithstanding, a significant number of the candidates still did not attempt it.

The following is a basic outline pseudo code with some sample codes added to assist test coding for solving the problem.

Declare variable for index number as Numeric type
Declare variable for Subject as String type
Declare variable for examination score as Number type

Input index number
Input subject
Input examination score
Format the header for output
Format the read data for output
Open a disk file for writing
Display the header output on screen
Write the header output to the disk file
Display the data output on screen
Write the data output to file
Close the file

The following programming code depicts a sample code to the above pseudocode:

```
CLS
PRINT "GRADING PROGRAM"
PRINT "----------------"
PRINT
PRINT
OPEN "c:\CANDIDATESFOLDER\GRADES" FOR OUTPUT AS #1
INPUT "ENTER STUDENT ID:  ", indexNumber ‘variable declared dynamically
as numeric  type
INPUT "ENTER SUBJECT:   ", subject$              ‘variable declared dynamically
INPUT "ENTER MARKS:    ", score                  ‘variable declared dynamically
as numeric type
IF score >= 90 THEN
   grade$ = "A"                                  ‘variable declared dynamically
ELSEIF score >= 80 THEN
   grade$ = "B"
ELSEIF score >= 70 THEN
   grade$ = "C"
ELSEIF score >= 60 THEN
   grade$ = "D"
ELSEIF score >= 50 THEN
   grade$ = "E"
ELSE grade$ = "F"

END IF
```

CLS
PRINT #1, "SUBJECT", "INDEX NUMBER", "SCORE", "GRADE" 'write header to file

PRINT "SUBJECT", "INDEX NUMBER", "SCORE", "GRADE 'display header on screen

PRINT #1, subject$, indexNumber, score, grade$ 'write data to file

PRINT subject$, indexNumber, score, grade$ 'display data on screen

By the nature of the question, candidates can capture only one record and format it for display and write to file i.e. saving to file.

Saving the captured data to file has been a major problem to all candidates whose responses were analyzed. Few candidates captured a screenshot of the QBASIC code and pasted into a WordPad document and saved it as GRADES.rtf. That is not what was expected.

Saving to file implies writing to disk file. This file must be OPENED in the folder created by the candidate. Using the OPEN command.

Let us examine the QBASIC command syntax for writing data to file or any other device for that matter according to BQ64.net website.

OPEN *fileName$* [**FOR** *mode*] [{ACCESS|{LOCK|SHARED}} [{READ|WRITE}] AS [#]*fileNumber&* [LEN = *recordLength*]

Parameters
(1) The *fileName$* is a STRING variable or literal file name (path optional) in quotes.
(2) FOR mode can be: APPEND (write to end), BINARY (read/write), INPUT (read), OUTPUT (write new) or RANDOM (read/write).
(3) GW-BASIC's *modeLetter$* is a STRING variable or the letter "A", "B", "I", "O" or "R" designating the OPEN modes above.
(4) *fileNumber&* can be any **positive** INTEGER or LONG whole number value or an unused value determined by the FREEFILE function.
The WRITE # file statement writes a list of comma separated variable values to a sequential file or port.

Syntax:
WRITE #filenumber&[, expressionList]
Description

filenumber& is the number of the file or device OPENed in the OUTPUT or APPEND modes.
expressionList is a comma-separated list of values to be written to the file or device.

WRITE can place any number and types of variable values needed in a file record separated by commas.

String values will have quotation marks although quotes are not required to read strings in CSV files with INPUT #.

Data files using WRITE normally will have the same number of values listed on each file line.

Data containing commas must be in quotation marks. Thousand separator number commas are illegal!

WRITE created files are normally read with INPUT #.

Strings may or may not include quotation marks.

Semicolons cannot be used in or following the WRITE statement!

Example: Write new data to a text file sequentially and reads it back to the program screen.

```
filename$ = "testfile.dat"
            x = 1: y = 2: z$ = "Three"

OPEN filename$ FOR OUTPUT AS #1 'opens and clears an existing file or creates new empty file

WRITE #1, x, y, z$

CLOSE #1

PRINT "File created with data. Press a key!"

K$ = INPUT$(1) 'press a key

OPEN filename$ FOR INPUT AS #2 'opens a file to read it

INPUT #2, a, b, c$

CLOSE #2

PRINT a, b, c$
WRITE a, b, c$

END
```

File content: WRITE string values will include quotation marks, but they are not required to read the file.

Our solution would therefore looked in manner as follows. The file will be created and saved on drive “C” in a folder “candidate's folder” and should have the name “GRADES”

```
CLS
OPEN "C:\CANDIDATESFOLDER\GRADES" FOR OUTPUT AS #1
INPUT "ENTER STUDENT ID:  ", idstudent$
INPUT "ENTER SUBJECT:   ", subject$
INPUT "ENTER MARKS:    ", marks
IF marks >= 90 THEN
   grade$ = "A"
ELSEIF marks >= 80 THEN
   grade$ = "B"
ELSEIF marks >= 70 THEN
   grade$ = "C"
ELSEIF marks >= 60 THEN
   grade$ = "D"
ELSEIF marks >= 50 THEN
   grade$ = "E"
ELSE
   grade$ = "F"
END IF
```

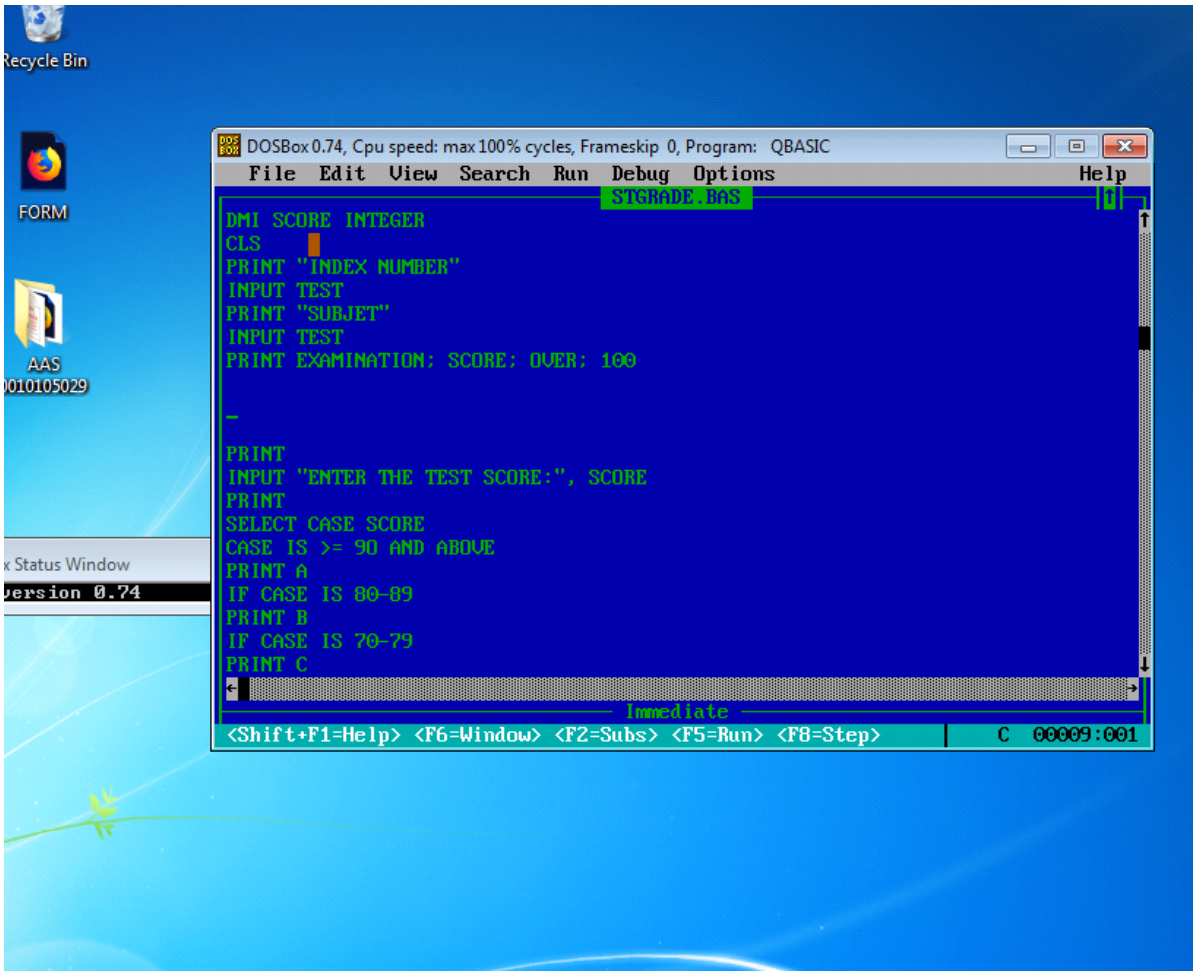
Formatting and outputting data to screen and saving as GRADES.
The nature of the question does not require candidates to run for number of times. Thus, no looping algorithm is required.

```
CLS
WRITE #1, "SUBJECT", "INDEX NUMBER", "SCORE", "GRADE" 'write header to file
PRINT "SUBJECT", "INDEX NUMBER", "SCORE", "GRADE" 'display header on screen
WRITE #1, subject$, idstudent$, marks, grade$ 'write data to file
PRINT subject$, idstudent$, marks, grade$ 'display data on screen
CLOSE #1
```

When this code is run, the candidate should find the file GRADES in the path “C:\candidate_folder\”

Saving code to file STGRADE
The question required candidates to save the code as STGRADE

In response to this, as can be seen from **Error! Reference source not found.** below, a candidate used the “***CTRL-prt sc”*** command to copy the screen, pasted it in a WordPad document, and saved as STGRADE.rtf



This approach is wrong. The code cannot be executed in a graphic format.

METALWORK 2

1. GENERAL COMMENTS

Generally, the standard of the paper and candidates' performance compared favourably with that of previous years.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Some candidates were able to produce neat sketches.
(2) Majority of the candidates who answered the question on precautions to be observed when using the hacksaw blade did well.
(3) Candidates were able to state one workshop test to identify mild steel and aluminium.
(4) Candidates were able to explain gating and pouring as used in foundry work.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Some candidates did not prepare well and scored low marks.
(2) Some candidates did not answer each question on a fresh page and mixed up answers of different questions on the same page.
(3) Candidates could not sketch the buttress thread.
(4) Candidates could not arrange given metals from most ductile to the least ductile.

4. SUGGESTED REMEDIES

(1) Tutors should ensure that the Metalwork syllabus is thoroughly covered before the examination.
(2) Candidates should be taken through the rules and regulations of using the Answer Booklet.
(3) Candidates should write the number of each question at the top of the page.
(4) Candidates should be taken through practical activities to enable them to answer practical questions correctly.

5. DETAILED COMMENTS

QUESTION 1

(a) (i) State three precautions to be observed when using the hacksaw blade.
(ii) State one advantage of the adjustable hacksaw over the fixed hacksaw.
(b) State two differences between a four jaw chuck and a three jaw chuck.
(c) Sketch the parting off tool in use.

(a) (i) This part of the question was well answered.

(ii) Some of the candidates could state one advantage of the adjustable hacksaw over the fixed hacksaw.

(b) Candidates were to state two differences between a four jaw chuck and a three jaw chuck. Performance was good.

(c) Some candidates could sketch the parting off tool in use well.

QUESTION 2

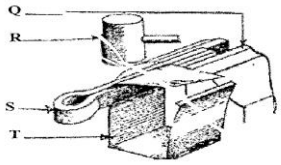


Figure 1

The sketch shown in Figure 1 is a setup for a metalwork operation.

(a) Identify the parts labelled Q, R, S and T;

(b) (i) State the function of the part labelled R;

(ii) State the reason why the tool labelled R is preferred to strike the artifact.

(c) Explain the term polishing as applied in metal finishes.

(d) Sketch the buttress thread form.

(e) State one use of the buttress thread form.

This was a popular question; however, performance was not generally good.

(a) The parts are Q – vice, R-mallet, S-folding bar and T-Workpiece. Majority of candidates provided good responses.

(b) (i) Majority of the candidates could state the function of the tool marked R.

(ii) The reason why R is preferred is that it prevents marks, dents and damages on the finished surface of the workpiece. A few candidates failed to state this reason.

(c) In answering this part of the question, some candidates were able to provide acceptable explanations.

(d) The sketch of the buttress thread form was not good in most cases.

(e) Some candidates were able to state one use of the thread form, which is generally used to cause displacements in mechanisms.

QUESTION 3

(a) State one workshop test each to identify the following metals:
- **(i) mild steel;**
- **(ii) aluminium.**

(b) Arrange the following metals from the most ductile to the least ductile:
- **(i) low carbon steel;**
- **(ii) copper;**
- **(iii) lead;**
- **(iv) aluminium.**

(c) Explain the following terms as used in foundry work:
- **(i) gating;**
- **(ii) pouring.**

(d) What is fettling in casting?

This was a popular question.

(a) Responses included hammering, scratching, cutting, dropping and bending for mild steel, and hammering, dropping, cutting and scratching for aluminium. Performance was good.

(b) Candidates were not able to arrange the given metals from the most ductile to the least ductile. The arrangement should have been:
- (i) copper;
- (ii) aluminium;
- (iii) low carbon steel;
- (iv) lead.

(c) (i)-(ii) The explanations given for both gating and pouring terms as used in foundry work were satisfactory.

(d) Majority of the candidates could explain what fettling is in casting.

QUESTION 4

(a) State two methods of carrying out investigation in a design process.
(b) With the aid of a sketch, show the process of swaging in forging.
(c) State two qualities of a quenching medium.
(d) List three driving tools.

(a) Most candidates answered this question. Some candidates could state two methods of carrying out investigation in a design process to include: preparing and using questionnaire, visiting shops/ mounting exhibitions, examining existing artifacts critically and discussing with other experts for their views.

(b) Majority of the candidates could sketch to show the process of swaging in forging.

(c) Majority of the candidates could not state the two qualities which should have included the following responses: high boiling point, low viscosity and high specific heat capacity.

(d) Majority of the candidates could list three driving tools.

QUESTION 5

(a) State the difference between hollowing and raising.
(b) Explain the following terms in machining:
(i) chamfering;
(ii) knurling.
(c) List two metals that do not require coolant when being cut.
(d) Explain the soft soldering process with reference to
(i) cleaning;
(ii) heating;
(iii) joining.

This was one of the popular questions and candidates' performance was satisfactory.

(a) In hollowing, metals are hammered into shallow bowls and dishes where as raising allow metals to be beaten into vases.
(b)(i-ii) Majority of the candidates could explain the terms.
(c) Performance was good in this question.
(d) Some candidates could explain the soft soldering process under the given headings.

METALWORK 3

1. GENERAL COMMENTS

Candidates' performance in the examination under review was generally impressive. Candidates performed well to produce the exercise given them to precise and accurate sizes.

The standard of the paper and performance of candidates are comparable to that of previous years.

The level of difficulty of the exercise administered in the paper was quite manageable and was within the scope of the syllabus.

Candidates were supplied with appropriate tools to carry out the exercise and did not lack anything that imperatively affected their performance.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Candidates could organize their work to meet the required standard.
(2) Many candidates showed improved cutting capabilities.
(3) Candidates attempted to produce all the parts that made up the assembly.
(4) Candidates were able to read and interpret the detailed drawings provided for the exercise.
(5) Candidates observed good safety practices, therefore, there were no reported case of accident to materials, tools and equipment.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Candidates' incessant failure to mark out workpieces before cutting – this generally led to inaccuracies.
(2) Candidates kept too much material to file to size. Material remaining to be filed after cutting should be minimum.
(3) Difficulty in filing flat, straight and square surfaces.
(4) Failure to use the drilling machine to drill relief holes.
(5) Ineffective use of measuring and marking out tools.
(6) Failure to deburr and clean filed edges – this gave rise to improper fitting.

4. SUGGESTED REMEDIES

(1) Candidates should be taught the correct steps to obtain accurate workpieces.
(2) Candidates should be taken through sufficient workshop exercises and projects to enable them acquire the necessary practices and experience.
(3) Candidates should be taught to keep file on the work surface and file straight, devoid of erratic movement of the file used.

(4) Candidates should be provided with the appropriate conditions to enable them carry out all the operations and activities demanded by the exercise given.
(5) Candidates' school work and exercises should be properly supervised and on regular basis.

5. DETAILED COMMENTS

QUESTION 1

The following materials were supplied:
(a) Flat mild steel plates, 105mm x 85mm x 3mm (2 off) for parts A and B;
(b) One cotton bag, 150 mm x 120 mm to enclose the finished work;

Candidates were given a diagram showing the assembly and detailed views of each part of a fitting exercise, and were required to prepare the parts and assemble the pieces.

PART A

Candidates were required to first mark out the profile or work as shown in the detailed drawing using the stated dimensions to obtain accurate size of the workpiece.

- The marked-out workpiece was to be dot punched to provide clear profile for accurate cutting.
- On the contrary, many candidates failed to carry out the marking out and spent much of their time filing large amount of metal to reach the required size.
- Some candidates failed to file the workpieces and presented their work as supplied.
- Candidates were expected to cut close to the dot punched profile, so that only small amount of metal could remain for filing to size.
- Candidates were also expected to mark out the positions for the three relief holes and also mark out the internal pentagonal shape. After marking out candidates were required to drill the relief holes and drill series of holes along the profile making sure that these holes did not destroy the marked shape.
- Candidates were therefore expected to cut through the stream of drilled holes using chisel and hacksaw.
- On completing the cut, candidates were required to file using rough or bastard file to bring the work to the required size.
- However, many candidates missed these important steps, hence, making cutting very difficult and impossible for them.

PART B

- Similarly, the workpiece plate should be marked out to the required dimensions to produce the profile indicated in the detailed drawing.
- After obtaining the accurate profile, the work ought to be dot-punched to provide clearer lines for cutting.

- The two relief holes ought to be drilled out before cutting through the dot-punched line with hacksaw to obtain the external part of the pentagonal shape.
- The cut workpiece should be smooth filed to size.
- Many candidates successfully performed processes to obtain the required shape.
- Candidates were expected to assemble the two parts to give transitional fit.

QUESTION 2

The following materials are supplied:

(a) One piece free cutting mild steel rod, Ø50 mm x 120 mm;

(b) One cotton bag 150 mm x 120 mm to enclose the finished work;

(c) Two tie-on labels.

Candidates were given the diagram of the detailed view of a machine part and were to produce the part using the material supplied.

- Candidates were required to start by facing both ends of the rod to the specified length of 100 mm.
- After facing, the rod ought to be turned down to diameter 40 mm.
- Holding the workpiece in a three-jaw chuck, one end of the rod should be reduced to diameter 25 mm x 60 mm.
- The undercut dimension Ø20 x 10 mm ought to be cut positioned 50 mm away from the end of the rod. Special form tool should be used to produce the undercut.
- After producing the undercut, candidates were required to cut the M 25 x 1.5 mm thread using a vee form thread cutting tool.
- The 40 mm diameter end of the rod was to be knurled with a diamond knurling tool.
- The exercise should be completed by producing 45° x 2 mm chamfer on both ends of the rod.

TECHNICAL DRAWING 2

1. GENERAL COMMENTS

The standard of the paper in relation to the quality of the questions as well as the marking scheme were precise and straight forward. The candidates' performance compared with those of the previous years.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Most candidates used the correct grade of pencils and outlines were clearly differential from construction lines.
(2) Some candidates did well by interpreting the orthographic projection into isometric projection.
(3) A few candidates produced the given lamina correctly and constructed to obtain the centre of gravity.
(4) Their linework and neatness of the drawings were perfect.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

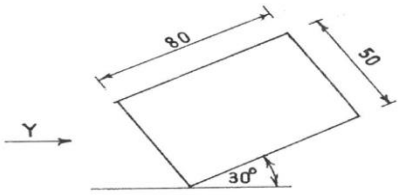
(1) Few candidates used BB pencils and as such their drawings became very dirty.
(2) Few candidates constructed the polygon but they were unable to convert the polygon to a triangle; both the vertical and horizontal projectors were not accurately drawn.
(3) Candidates could not copy the two given views of the lamina. The two methods for constructing the true shape of the lamina were poorly constructed. Average candidates could not interpret the orthographic projection to isometric projection. The lowest point was wrongly positioned. The determination of the centre of gravity of the lamina involved the conversion of the sizes to the given scale; but candidates' work was poor.

4. SUGGESTED REMEDIES

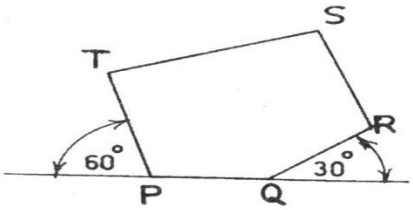
(1) Candidates must be familiar with the grade of pencils; grade H for construction lines and grade HB for outlines.
(2) Candidates should revise the first year topics before final examinations, e.g the conversion of equal areas of figures, enlargement and reduction of similar figures, etc.
(3) Candidates should be taught how to solve questions which contain a sketch of one or two views given dimensions or angles for the construction.
(4) Candidates are advised to practise more exercises on scale conversion. E.g. 400 mm x 600 mm becomes 24000 mm^2. Using a scale of 400 mm^2 = 1 mm then 24000 mm^2 is represented on the paper as 60 mm, i.e 24000 $mm^2 \div 400$ mm^2.

5. DETAILED COMMENTS

QUESTION 1



(a) Figure 1 shows an elevation of a rectangular block resting on its breadth 80. Draw full size, in first angle, the:
- **(i) given view;**
- **(ii) plan;**
- **(iii) end view in the direction of arrow Y.**



(b) Figure 2 shows a polygon with sides PQ = RS = 60 and ST = 80.
- **(i) draw the given polygon;**
- **(ii) draw a triangle equal in area to the polygon;**
- **(iv) measure and state all the sides of the triangle.**

(a) THE RECTANGULAR BLOCK:

The given rectangular block was drawn at 30° to the horizontal. Lines from the four corners of the block were projected down the given block. A horizontal line was drawn across the projectors as x – x axis. A line measured 80 mm was marked on the projectors as the breadth of the block. The horizontal outlines, three vertical outlines and one hidden outlines were drawn to complete the plan. To draw the end view of the block, four horizontal lines were projected from the corners of the block and extended to the right. The base length 80 mm of the end elevation was obtained. (i.e. using rabatment or 45° line method). Two vertical outlines and four horizontal outlines (one hidden) were drawn to complete the end elevation. The three views were then labelled accordingly.

(b) CONVERSION OF IRREGULAR POLYGON:

Construction of the pentagon: The base length 80 mm was drawn and extended on both sides to draw angles 60° and 30° to the left and right respectively. The given dimensions were used to complete the pentagon.

Conversion of irregular pentagon to triangle: Lines from the highest point of the pentagon were joined to the ends of the base length 60 mm. Lines from the other points of the

pentagon were drawn parallel to the inner lines to locate the base length of the triangle. The lines were firm in to obtain the triangle.

QUESTION 2

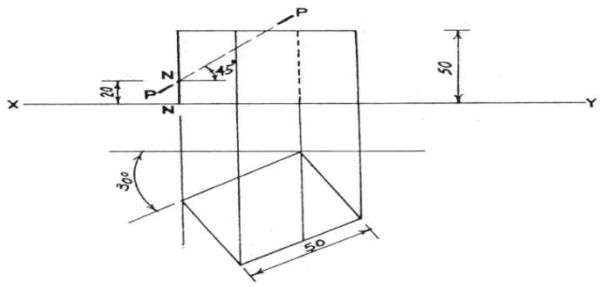


Figure 3 shows the elevation and plan of a square prism made of sheet metal placed on a horizontal plane. It is opened at the top and cut by a plane P – P.

Draw full size, the:
(a) given views;
(b) true shape of the section;
(c) complete plan;
(d) surface development, using N – N as the seam.

SQUARE PRISM

For the two given views, the plan was constructed before the front elevation. To construct the plan, angle 30° was drawn to the horizontal and a length of 50 mm, one side of the square prism was marked on it. The plan was completed by marking four equal lengths, i.e 50 mm each. Lines were projected up from the four corners of the prism from the plan. The given front elevation was copied on the five projectors and the cutting plane placed at 45° to the horizontal on the top side of the completed front elevation.

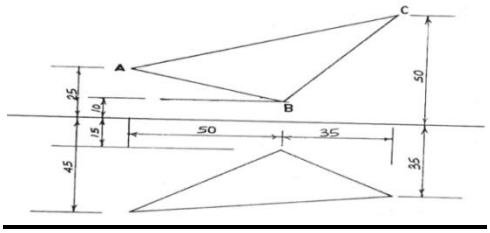
Candidates' performance was good.

The true shape of the cut surface: three perpendicular projectors were drawn to the cutting plane and extended into the work. X –X axis was drawn perpendicular to the three projectors. Using the horizontal line on the plan as an x –x axis, distances between the plan and edges of the elevation were measured and transferred accordingly to the new x – x axis on the projectors to locate the position of the cut surface.

Surface Development: Horizontal lines from the cut surface, both bottom and top of the front elevation were drawn to the right. Four equal distances, i.e 50 mm were marked on the base line as the perimeter and perpendicular lines drawn from the marked points to intersect the horizontal lines. Points on the cut surface were located and joined together to complete the surface development using the shortest opening (N-N).

Candidates' performance was generally fair.

QUESTION 3



Two views of a triangular lamina are shown in figure 4.

(a) Copy the given views.

(b) Construct the true shape of the triangle.

(c) Measure and state

(i) the lengths of the true shape of the triangle;

(ii) the angle of inclination of the triangle to the horizontal plane.

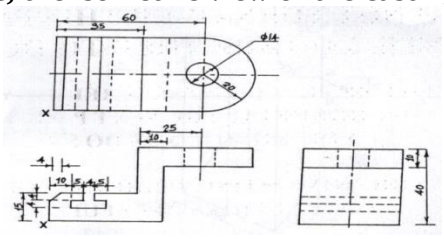
TRIANGULAR LAMINA

Copying the given view: The front and plan elevations were copied accurately. To obtain the true shape of the lamina, there were two methods involved the auxiliary projection and by rotation. For the auxiliary method, projectors were drawn from both the elevation and plan to obtain first auxiliary elevation. Further projectors were drawn from the first auxiliary elevation. The true lengths were located using the corners of the plan and the first auxiliary elevation. (see Fig. 1). The angle of inclination was obtained by measuring the base of the plan and the X, Y axis. The rotation method was done by taking each side of the lamina independently to find the true length. Thereafter the new lengths so obtained were used to construct the new shape of the lamina.

Candidates' performance was good.

QUESTION 4

Figure 5 shows the orthographic view of a casting in third angle projection. Draw full size, the isometric view of the casting making X the lowest point.



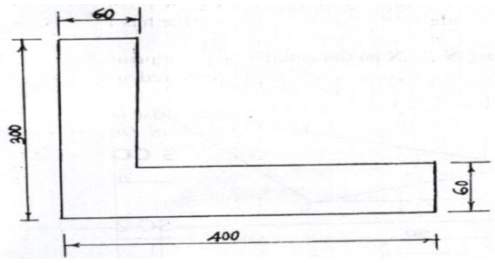
ISOMETRIC BLOCK

The isometric axes were drawn using the given lowest point. The three views were visualized into a block and the front elevation placed on the right side of the isometric axes. The plan, using the given dimensions and the shape of the faces, was located and placed

accurately at the respective positions vis-à-vis with the dimensions and shapes of the end elevation.

Candidates' performance was good.

QUESTION 5



Determine graphically the centre of gravity of the L-shaped figure shown in Figure 6. Use a scale of 1 mm = 4 mm for linear dimension and 1 mm = 400 m^2 for load scale.

CENTRE OF GRAVITY OF L-SHAPED FIGURE

The L-shaped figure was copied to the given scale of 60 mm = 15 mm, 300 mm = 75 mm and 400 mm = 100 mm). The shape was divided into two rectangles either vertically or horizontally. The diagonals of each rectangular piece was drawn to intersect at a point to locate the centre of gravity of each piece. The figure was divided into two vertically, so the area of each piece was 1800 mm^2 (60 x 300) and 20400 mm^2 (60 x 340). Each area was converted into area line as 45 mm and 51 mm using the given scale 1 mm = 400 mm^2. Using the Bow's notation, the spaces were labelled and the area diagrams were constructed for both horizontal and vertical triangles. The radial lines of the triangles were used to draw parallel lines to intersect the corresponding vertical and horizontal lines from the intersecting points of the diagonals to obtain new triangles within. Lines were projected from the apexes of the two produced triangles to intersect at a point outside the figure but within the arm or the L-shaped figure as centre of gravity.

Candidates' performance was good.

TECHNICAL DRAWING 3

1. GENERAL COMMENTS

The standard of the paper has been maintained and within the candidates' ability. Candidates' performance compared with those of the previous years were at par.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) The quality of lines and neatness of work presented has improved.
(2) Most of the candidates were able to sketch the isometric block correctly from the orthographic views.
(3) Majority of candidates were able to draw to the correct scale.
(4) The draughtsmanship of some candidates was encouraging.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Most of the candidates had difficulty in identifying the hand tools.
(2) Candidates who opted for the mechanical drawing were not able to assemble the parts correctly.
(3) Centre lines were not drawn correctly.
(4) Sectioning was a problem to some of the candidates who answered the mechanical drawing.
(5) Most candidates used instruments to do the freehand sketching.
(6) Drawing of building symbols was a major problem to candidates.
(7) Labelling of the views in the building drawing was left out in the candidates' drawings.
(8) Candidates had difficulties in converting views from orthographic to isometric.

4. SUGGESTED REMEDIES

(1) Candidates should practice freehand sketching, especially, hand tools and machine parts.
(2) Candidates should learn the correct conventions for drawing details, such as windows, doors, beams, earth, ground level, roof members, hardcore and finish floor.
(3) Teachers should intensify on the teaching of lines and their applications, that is candidates must be able to differentiate between the various type of lines and their applications.

5. DETAILED COMMENTS

QUESTION 1

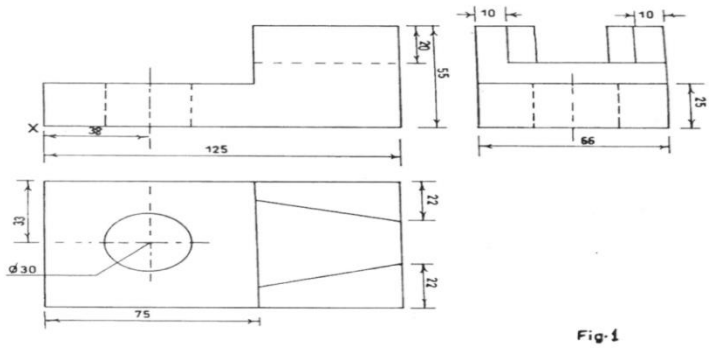


Fig-1

Figure 1 shows a block in orthographic projection. Make a freehand pictorial sketch of the block making X the lowest point.

Three views of a block was drawn in orthographic projection. Candidates were asked to convert the orthographic drawing into a freehand pictorial drawing, making a particular point the lowest, i.e point x.

Freehand pictorial drawing was therefore required.

Most candidates drew with guided instruments instead of drawing in freehand.

Candidates' performance was however generally fair.

QUESTION 2

Make a freehand pictorial sketch of a bolster.

Candidates were asked to make a freehand pictorial sketch of a bolster, used by builders. Identification and sketching of basic hand tools was the requirement.

Most candidates, who attempted this question, did well by sketching the correct tool in pictorial view. Only a few candidates sketched in two dimensions.

Candidates' performance was good.

QUESTION 3

Make a freehand pictorial sketch of a straight snip.

This question, like question two, also intended to test candidates' ability to identify common hand tools in the workshop and on site.

Candidates were asked to draw a freehand pictorial sketch of a straight snip, a tool used by the tinsmith.

Few candidates attempted this question. The few who attempted this question, were unable to sketch the tool. Generally, the sketches provided were very poorly done.

QUESTION 4

A sketch plan of a three bedroom bungalow with its accompanying specification from foundation to roof was provided for candidates to study and answer the questions that followed.

Candidates were asked to draw to a scale of 1:100 floor plan and the front elevation of the bungalow. They were also asked to draw the sectional on plane on X-X.

Most candidates provided good answers to the questions. The draughtsmanship in most cases was very commendable.

It was however, evident in a few cases that the candidates do not know what they were doing. No adherence to basic drawing principles and the use of BS1149 was not considered, in most cases.

Candidates' performance was good.

QUESTION 5

A detailed part of a pulley bracket Assembly was provided for candidates to assemble.

Candidates were asked to draw to full size, in first angle projection, the end view and sectional view in the direction of a plane, the assembled pulley bracket.

Candidates provided good answers to the questions. Some few candidates who attempted this question drew the plan of the assembly which was not requested by the question.

In some of the answers provided by the candidates, views were wrongly placed. Also centre lines were not drawn.

Candidates' performance was fair.

WOODWORK 2

1. GENERAL COMMENTS

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

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Most candidates demonstrated very good pencil work.
(2) Most candidates produced neat freehand sketches.
(3) Majority of candidates showed demonstrable skills in orthographic projection.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Most candidates failed to name or either label nor dimension the views provided.
(2) Some candidates did not adhere to the dictates of the rubrics. They failed to select the developed sketch from the initial sketches.
(3) Some candidates wasted their time to sketch a third sketch which attracted no marks instead of the two demanded by the question in Section B.
(4) Most candidates did not draw border lines and title blocks.

4. SUGGESTED REMEDIES

(1) Teachers must give candidates more exercises to practise how best to answer questions.
(2) Candidates should be advised to adhere to the dictates of the rubrics to prevent the losing of much needed marks.
(3) Teachers should impress upon candidates to avoid trivialities and go straight to the point when answering questions.
(4) Teachers should inculcate in candidates the need to draw border lines and title blocks as they attract marks.

5. DETAILED COMMENTS

SECTION A

QUESTION 1

(a) Name two methods of carving wood.
(b) List four types of wood turning operations.
(c) List four factors to consider when planning the construction of a designed project.

(a) Most candidates answered this question very well.

(b) Majority of candidates could not list the wood turning operations. The required answers include: face (face plate) turning; turning between centres (spindle turning); cup chuck turning; boring in the lathe.

(c) Most candidates listed the correct factors to answer the question. A few however, listed factors to consider when designing.

The required answers include

understanding the working drawing; tools required; machines required; availability of materials; cost of materials, labour cost, etc.

QUESTION 2

For other member countries.

QUESTION 3

(a) State two safety precautions to be observed when using a grinding stone.
(b) List two types of each of the following:
(i) machine saws;
(ii) portable power saws.
(c) List two tools that are used to remove nails from a workpiece.

(a) Majority of candidates answered this question very well.

(b) The first part of the question was very well answered by most of the candidates. Majority of the candidates however, could not answer the second part well. They listed hand saws instead of portable power saws.

The required answers include:

circular saw, jig saw, chain saw, etc.

(c) This question was well answered by most of the candidates.

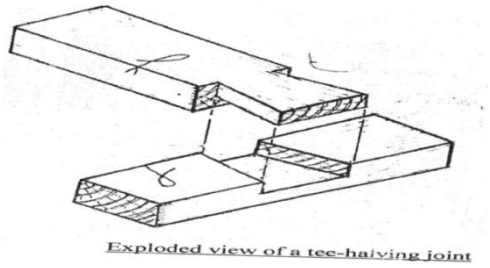
QUESTION 4

(a) List two types of paint that are used in finishing a cabinet.
(b) State one characteristic of a seasoned timber.
(c) Make an exploded pictorial sketch of the dovetail tee-halving joint.

(a)&(b) These questions were very well answered by most of the candidates.

(c) Majority of the candidates were not able to produce the exploded pictorial sketch of the dovetail tee-halving joint.

The sketch is shown below:



Exploded view of a tee-halving joint

SECTION B

A coffee table is to be designed to the following specifications:
Length - 750;
Width - 450;
Height - 400.

The coffee table has a shelf half-way down the top. The top and the shelf are each to be made from 12 mm plywood. The underframe is to be constructed from 30 mm hardwood.

QUESTION 1

Make two preliminary freehand pictorial sketches each for a different design of the coffee table.

A few candidates presented designs that agreed with the given specifications. Some of them however, produced the sketches with the aid of drawing instruments.

QUESTION 2

Select one of the sketches in Question 1 and indicate the sketch selected with a tick (√). To a scale of 1:5 draw in Third Angle Orthographic projection the following views of the sketch selected:

(a) the front elevation;
(b) the plan with top removed.

(a) All the candidates attempted this question, however only a few were able to place the view on its proper plane. Most of the candidates failed to show the shelf, top, rail, main dimensions and name of the views.

(b) Most of the candidates failed to draw this view in its appropriate position. The few who presented the correct view however failed to show the side rails, end rails, legs in section and dimensions.

DRAUGHTSMANSHIP

(i) Most candidates failed to draw the border lines and title blocks.
(ii) Majority of candidates did not organize their work properly and as such presented disorganized work.

WOODWORK 3

1. GENERAL COMMENTS

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

The performance of the candidates was above average.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Most candidates were able to interpret the working drawings correctly.
(2) Most candidates assembled their finished work.
(3) Most candidates constructed good joints.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Some candidates could not mark-out accurately.
(2) Most candidates could not work to the required dimensions.
(3) Candidates used poor quality and blunt cutting tools.

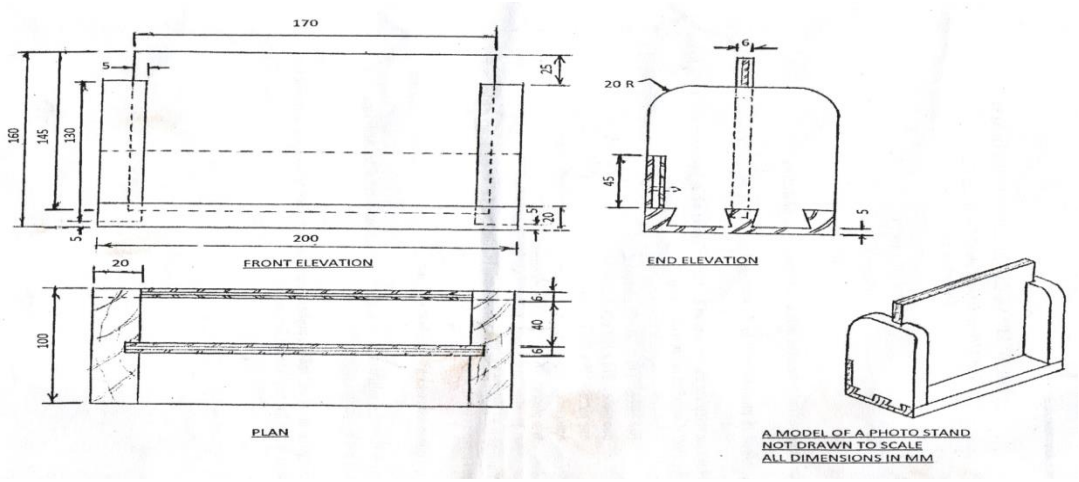
4. SUGGESTED REMEDIES

(1) Teachers should effectively demonstrate the correct procedure for marking-out practical exercises.
(2) Teachers should inculcate in the candidates the requisite skills required for sawing and chiseling out waste to the given dimension.
(3) Teachers should endeavour to guide candidates to sharpen their cutting tools before the examinations.

5. **DETAILED COMMENTS**

QUESTION 1

Candidates were given working drawings of a model of a photo stand. They were required to interpret the drawings and construct the model using already prepared workpieces.



The work involved the following processes:

(a) Construction of lapped dovetail joints;
(b) Construction of partitioning;
(c) Fixing plywood back;
(d) Rounding corners of side pieces;
(e) Finishing.

(a) LAPPED DOVETAIL JOINTS

The construction of the lapped dovetail joints was attempted by all the candidates. A good number of candidates were able to mark-out the joints correctly and produced fairly good joints. However, some of the candidates lacked the requisite skills to saw and remove waste wood from the tails and sockets of the joints and as a result produced poor work.

A small percentage of the candidates constructed through dovetail joints instead of the lapped dovetail joints. A few others also constructed comb joints instead of the lapped dovetail joints.

(b) PARTITIONING

The construction of the partition was attempted by majority of the candidates. Few candidates were able to mark-out accurately and run very good grooves. They were able to plane the sides of the plywood and fitted it correctly. However, a good number of

candidates were not able to cut and remove waste wood from the bottoms of the grooves and as a result produced very poor work. A small percentage of candidates produced vee grooves which could not accommodate the plywood.

(c) FIXING PLYWOOD BACK

This question was attempted by almost all the candidates. Candidates were required to mark-out and cut the notches to receive the plywood and screw it in place.

Most of the candidates performed creditably in this question. A few candidates cut stub notches instead of through notches as indicated on the working drawing.

A few others failed to cut the notches but screwed the plywood directly to the back.

(d) ROUNDING

Majority of the candidates attempted this question. Few of the candidates who were fortunate to have the appropriate tools for rounding wood surfaces were able to produce appreciable work. A few of the candidates did partial roundings while some of the candidates cut ordinary bevels instead of the roundings.

(e) ASSEMBLING

Majority of the candidates were able to assemble the work. A few of the candidates did partial assembling. Some candidates however, could not assemble their work but did well to tie the pieces together for easy identification.

(f) Candidates were required to clean the surfaces of the assembled work of all pencil marks using the smoothing plane to give the needed appeal. On the contrary majority of candidates failed to dress the work.