MAY/JUNE 2014 WEST AFRICAN SENIOR SCHOOL

CERTIFICATE EXAMINATIONS

RESUME OF CHIEF EXAMINERS REPORTS FOR THE TECHNICAL SUBJECTS

1. GENERAL COMMENTS

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

The performance of candidates ranged from declining in Auto Mechanics 2, Technical Drawing 2 and Applied Electricity 2, average in Metalwork 3 and Auto Mechanics 3 to better in Technical Drawing 3, Woodwork 3, Applied Electricity 3 and Building Construction 3.

Information and Communication Technology (ICT) Elective was written for the first time and the standard of the papers were said to be appropriate for the Senior Secondary level.

Performance however was poor for ICT 2 and that of ICT 3 woefully inadequate.

2. A SUMMARY OF CANDIDATES' STRENGTH

(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 3 and Auto Mechanics 2.

(b) INDEPTH KNOWLEDGE OF SUBJECT MATTER

It was reported that a few candidates showed excellent knowledge in the subject matter. Candidates showed very good instrument reading in Applied Electricity 3, and in Technical Drawing 2, a few candidates presented good quality line work. Auto Mechanics 2 had some candidates explaining principles well and supporting their explanations with accurate sketches. Candidates writing Technical Drawing 3 were said to have commendable draughtsmanship skills. Interpreting the working drawing covering the exercise to be produced were well done by many candidates as reported in Metalwork 3 and Woodwork 3.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(a) LACK OF ADEQUATE PREPARATION

Candidates could not identify essential parts of components in Auto Mechanics 3 and in Technical Drawing 3 could not sketch tools in pictorial form. Candidates' failure to utilize well sharpened and good conditioned tools in Woodwork 3 points to inadequate preparation for the examination. In ICT 3 for instance, most candidates could not save their work on the CDs provided and hence could not get any mark.

(b) LACK OF INDEPTH KNOWLEDGE OF SUBJECT MATTER

A significant number of candidates did not know what a database software is and used Microsoft Excel instead of Microsoft Access in ICT 3. It was also reported that candidates did not have good logical reasoning skills needed in ICT 2. There were a lot of deviations in answering questions in Auto Mechanics 2 due to misunderstanding. There was lack of proper understanding of the principles of multiplane in Technical Drawing 2 as well as poor sketches in orthographic projections. Candidates were not able to plot graphs correctly as noted in Applied Electricity 3.

(c) LACK OF ADHERENCE TO RUBRICS OF EXAMINATION

Following simple instructions as to how to use the answer booklet by some candidates was very bad. Answers to sub-questions were scattered all over as indicated by Chief Examiners of ICT 2 and Auto Mechanics 2.

(d) LACK OF PRACTICAL EXPOSURE

In ICT 3, many candidates submitted blank CDs showing lack of practice and in Metalwork 3 the examiner reported that dimensional maintenance and control was very poor. Some candidates of Auto Mechanics 3 could not select the correct tools for the correct job while some had problems fixing parts they had removed. Candidates were unable to mark out accurately in Woodwork 3.

(e) POOR EXPRESSIONS

Expressing ideas in English Language was poor as seen in Building Construction 3 and ICT 2.

APPLIED ELECTRICITY 2

1. GENERAL COMMENTS

The standard of the paper was comparable to that of previous years.
The general performance of the candidates was average relative that of the previous years.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Candidates' lines diagrams of circuits were very accurate and neat.
(2) Majority of the candidates attempted questions as stated by the instructions and rubrics.
(3) Majority of the candidates demonstrated a good understanding of logic circuits and direct current machines.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

Candidates' weaknesses were noted in the following areas:
(1) most of the candidates could not state Lenz law;
(2) candidates could not explain basic electrical theory and principles;
(3) candidates could not explain the losses due to current in a d.c. machine.

4. SUGGESTED REMEDIES

(1) Teachers should effectively teach students the technique in responding to rubrics.
(2) Candidates should learn the fundamentals of Physics to broaden their knowledge base in Applied Electricity.
(3) Teachers should lay more emphasis on the types of d.c. machines and their losses.
(4) Teachers should endeavour to complete the syllabus to adequately prepare candidates for the examination.

5. DETAILED COMMENTS

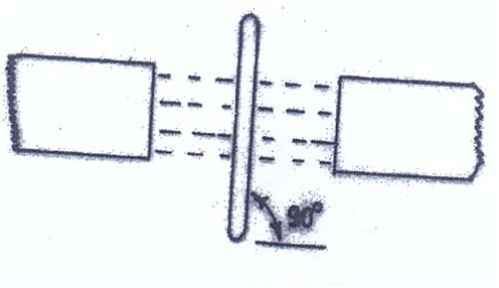
Question 1

(a) (i) Define resistance.
(ii) State two factors which affect the resistance of a conductor.
(b) The resistance of a conductor is 40Ω. If the cross-sectional area of the conductor is $4 \times 10^{-6} m^2$ and resistivity is $1.783 \times 10^{-6} \Omega m$, calculate the length of the conductor.

(a) & (b) Majority of the candidates were able to define resistance and stated the factors which affect the resistance of a conductor. Few candidates could not respond to calculating the length of a conductor.
Performance of the candidates was good.

Question 2

(a) State Lenz's law



(b) The conductor in Fig. 1 has a length of 40 cm and carries a current of 20 A in a magnetic field of flux density of 0.8 T. If the conductor moves at a velocity of 30 m/s, calculate the;
(i) force acting on the conductor;
(ii) induced e.m.f.

(a) & (b) This was a very popular question amongst the candidates. Majority of the candidates stated the Lenz's law, i.e. the direction of an induced e.m.f. is always such that it tends to set up a current opposing the motion or the change of flux responsible for inducing it.
Majority of the candidates were able to calculate the force acting on the conductor and the induced e.m.f. Performance of the candidates was generally good.

Question 3

(a) Draw and label the circuit diagram of 2 two-way switches controlling two lamps in parallel.
(b) State the function of the following accessories:
(i) switch;
(ii) fuse.

(a) &(b) Majority of the candidates drew and labelled the circuit diagram of a 2 two-way switches controlling two lamps in parallel, stated the functions of a fuse and switch.
Performance of candidates was very good.

Question 4

(a) Explain damping as applied to electrical measuring instruments.
(b) State two advantages of a digital meter over an analogue meter.
(c) A moving-coil instrument has a resistance of 10Ω with a full-scale deflection (f.s.d.) of 8 mA. With the aid of a sketch, calculate the value of a multiplier that will enable it read up to 100 V.

(a),(b)&(c) Most candidates could not explained damping as applied to electrical measuring instruments. The appropriate response is as follows:
Damping is the combination of the inertia of the moving system and the controlling torque of the spiral springs.

Majority of the candidates stated advantages of digital meter over analogue meter, i.e. high impedance hence less error, and easily readable and gives accurate figures.
Majority of candidates were able to interpret the circuit diagram of the moving-coil instrument into its schematic diagram and calculated the value of the multiplier.
Candidates' performance was fair.

Question 5

(a) State the loss in a d.c. machine due to PR heat losses.
(b) The armature of a d.c. machine has a resistance of 0.25 Ω and is connected to a 240 V supply. Calculate the e.m.f. generated when it is running as a:
(i) generator giving 88 A;
(ii) motor taking 68 A.

(a) & (b) Most candidates could not state the loss in a d.c. machine due to I^2R heat losses. The loss is Copper loss.
The e.m.f. generated when the d.c. machine is running as generator giving 88 A and as motor taking 68 A are as follows:

As a generator (e)
$E = V + I_aR_a$
$E = 240 + (88)(0.25)$
$E = 262$ V

As a motor
$E = V - I_aR_a$
$E = 240 - (6)(0.25)$
$E = 223$ V

Performance of candidates was generally poor

Question 6

(a) Draw the truth table for each of the following two-input gates:
(i) OR;
(ii) NAND.
(b) Write the Boolean expression for the logic gates in 6(a).

(a) &(b) A well attempted question by majority of the candidates. Almost all candidates who responded had the solution correct.
Candidates' performance was very good.

Question 7

(a) State two advantages of integrated circuits.

(b) Explain with the aid of a diagram how a zener diode can be used as voltage regulator.

(a) & (b) Majority of the candidates could not answer the advantages of the integrated circuits. The advantages are as follows:

(i) Extremely small size thousand times smaller than discrete circuits.
(ii) Suitable for small signal operation.
(iii) Very small weight due to miniaturized circuit.
(iv) Improved functional performance .

Candidates explained with the aid of a diagram how a zener diode can be used as a voltage regulator.
Performance of the candidates was generally fair.

APPLIED ELECTRICITY 3

1. GENERAL COMMENTS

The standard of the paper was comparable to that of previous years.
Candidates' performance compared with the previous years was at par.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Majority of the candidates plotted very good graphs using the points of best fits.
(2) Candidates were able to connect the circuit diagrams using the required apparatus.
(3) Majority of the candidates distinguished between the source voltage and the corresponding varied currents.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Candidates wasted time by copying the rubrics which was otherwise not demanded by the questions.
(2) Candidates failed to provide suitable scales in plotting the current-voltage characteristics.

4. SUGGESTED REMEDIES

(1) Teachers should demonstrate the use of the ammeters and voltmeters.
(2) Candidates should practise more practical activities to raise their skill and competence levels.
(3) Teachers should guide candidates to use the required textbooks on Applied Electricity to improve their level of understanding in the subject.

5. DETAILED COMMENTS

Candidates were provided with the following apparatus:
one d.c. voltage source (10V);
one d.c. voltage source (12V);
one variable d.c. power supply (0-30V);
one 470 Ω, ¼ W resistors;
two 1kΩ, ¼ W resistors;
two 2.2 kΩ, ¼ W resistors;
two 3.3 kΩ, ¼ W resistors;
three d.c milliammeters (-10 mA);
one digital multimeter;
three toggle switches;
a set of hand tools;
connecting wires.

Question 1

AIM: To determine current in any branch of a circuit.

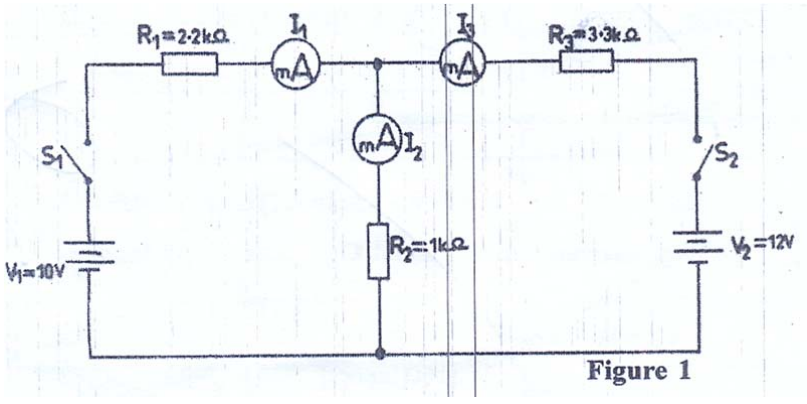


Figure 1

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

TABLET 1

Source	I_1(mA)	I_2(mA)	I_3(mA)
V_1 and V_2			
V_2 only			
V_1 only			

(d) **Switch on both V_1 and V_2 simultaneously.**
(e) **Read and record in Table 1 the ammeter readings I_1, I_2, and I_3.**
(f) **Switch off both V_1 and V_2.**
(g) **Remove V_1 and close the circuit through a link.**
(h) **Switch on V_2.**
(i) **Read and record in Table 1 the ammeter readings I_1, I_2, and I_3.**
(j) **Switch off V_2, remove it and close the circuit through a link.**
(k) **Replace V_1 and in the circuit and switch it on.**
(l) **Read and record in Table 1 and ammeter readings I_1, I_2, and I_3.**
(m) **Switch off the circuit.**
(n) **Compare** **(i)** **I_1 (V_1 only) + I_1 (V_2 only) with I_1 (V_1 and V_2);**
(ii) **I_2 (V_1 only) + I_2 (V_2 only) with I_2 (V_1 and V_2).**

Candidates were to investigate and determine the current in any branch of a circuit. Candidates were required to connect the given circuit diagram, i.e. two resistors in series connected to a resistor, two switches and two input voltages as supplies. Majority of the candidates were able to connect the circuit diagram correctly but could not compare the current in the voltage supply with the two voltages, i.e the source voltages.
On comparing I_2 (V_1 only) + I_2 (V_2 only) with I_2 (V_1 and V_2), majority of the candidates inferred that the result in each case was the same.
Candidates' performance was fair.

Question 2

AIM: To determine the equivalent resistance of a circuit.

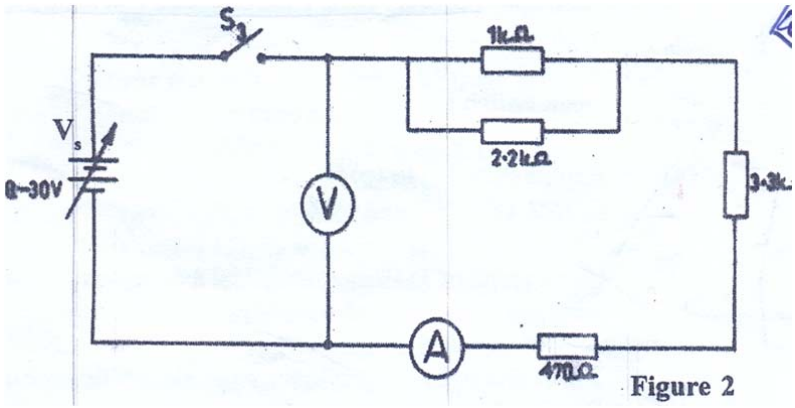


Figure 2

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

TABLET 1

Source voltage, V_S(V)	Ammeter reading (mA)	Voltmeter reading (V)
5V		
10V		
15V		
20V		
25V		

(d) Close switch S_3.

(e) Adjust the source voltage V_S to 5V.

(f) Read and record in Table 2 the ammeter and voltmeter readings.

(g) Open switch S_3.

(h) Repeat steps (d) to (g) by increasing the source voltage V_S to 10V, 15V, 20V and 25V.

(i) Plot a graph of V(V) on the vertical axis against I(mA) on the horizontal axis.

(j) Determine from the graph, the equivalent resistance of the circuit.

In Question 2, candidates were to determine the equivalent resistance of a circuit connected in a series-parallel.

Candidates were to vary the source voltage in steps of 5V at the same time take the ammeter and voltmeter readings, and from the results obtained plot a graph of voltage on the vertical axis against current on the horizontal axis.

Majority of the candidates had very accurate values and therefore were able to plot good graphs. Few candidates could not determine the slopes of the graphs they drew.

Generally, performance of the candidates was average.

AUTO MECHANICS 2

1. GENERAL COMMENTS

The standard of the paper was of the required quality and compared favourably to that of the previous years. However, candidates' performance continue to decline as compared to that of the previous years.

2. A SUMMARY OF CANDIDATES' STRENGTHS

Although the performance of candidates below expectation, there were some few commendable features as follows:

(1) (i) A few candidates sketched the thermosyphon cooling system and labeled the sketches as expected with leader lines.
(ii) The demerits of the thermosyphon cooling system were also clearly stated by candidates.
(2) An average candidate stated the material for making brake lining and the methods of attaching brake lining to the shoe.
(3) Majority stated the merits of disc brake.
(1) Majority of the candidates were able to identify the engine components labeled U, V, W and Y and the function of the parts labeled V, X and Y were stated.
(2) The explanation of how induction is achieved as required by Q4 (b), was well explained and some supported the explanation with accurate sketches.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Some candidates' mode of numbering their answers were poor, e.g. writing more than one answer on the same page in the answer booklet as opposed to the rubric of the paper.
(2) Some failed to write the question numbers against the answers provided.
(3) A lot of candidates deviated in providing answers to some specific questions due to misunderstanding.
(4) The type of sketches provided indicated lack of practice by candidates.
(5) Candidates who made sketches could not label them correctly.
(6) Explanation of the operation of the master cylinder was poorly done.

4. SUGGESTED REMEDIES

(1) Emphasis on how to answer examination questions should be taught. Rubrics on the answer booklet should be well read and understood.
(2) Candidates should practice the sketch of components and systems of the motor vehicle regularity.
(3) Candidates should practice labelling parts of sketches regularly.
(4) They should answer questions in clear and simple language.
(5) Candidates should avoid writing long answers which eventually make hazy the salient points.

5. DETAILED COMMENTS

Question 1

(a) (i) Sketch the thermo-syphon cooling system.
(ii) Label four parts of the sketch in (i).
(iii) State two demerits of thermo-syphon cooling system.
(b) Explain the term convection current.

(a) (i) A few candidates sketched the system nicely whilst the rest made sketches of parts of the cooling system.

(ii) Majority of candidates who were able to sketch the system correctly were also able to label. The rest were just listing the names of parts under the sketch.

(iii) Candidates were required to state two demerits of a thermo-syphon cooling system and majority answered correctly.

(b) Majority of candidates only defined the term convection as the transfer of heat through liquid and gases instead of explaining that circulation of water is due to change in densities, i.e. as hotter water becomes light and move up to the top while the colder one is denser and comes down to occupy the space.

Question 2

(a) (i) Name the material used for making brake lining.
(ii) List three properties of brake lining material.
(i) List two methods of attaching brake lining to shoes.
(b) State:
(i) two merits of disc brake;
(ii) one demerit of disc brake.
(c) Explain the action of the master cylinder when the brakes are applied.

(a) (i) The materials were named by majority of candidates as Asbestos, Kevlex fiber and synthetic resin or phenol-formaldehyde. However, a few of them named rubber as the material for brake lining.

(ii) Majority of candidates answered correctly by listing the properties whilst a few of them did not attempt the question at all.

(iii) The two methods were stated by only a few as bonding and riverting and the rest stated bolt and nuts or glue.

(b) Majority stated the merits well. Majority could not provide the demerit and just a few answered correctly.

(c) Majority of candidates could not explain the action of the master cylinder.

Question 3

(a) List four components in the primary circuit of the ignition system.
(b) Explain how a high voltage is induced in the secondary winding of the ignition coil.
(c) Explain why some ignition coils are filled with oil.
(d) Name one component in the ignition system that can cause backfiring.
(e) State two effects of too small contact breaker gap.

(a) A few candidates listed the primary circuit components, however, majority could not differentiate between the primary circuit components and the secondary circuit components.

(b) A few candidates explained how voltage is transformed while majority did not answer this question.

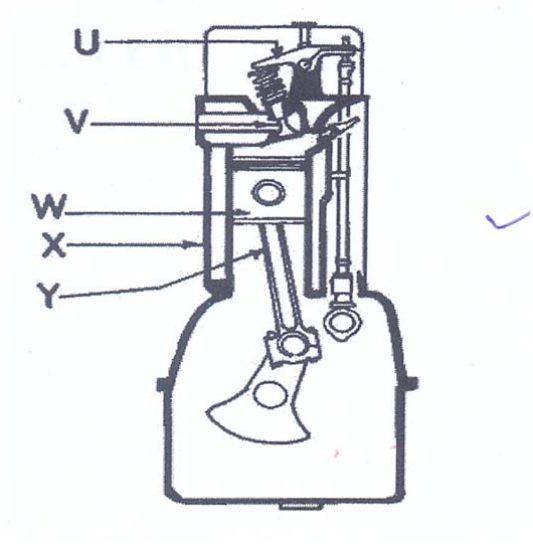
(c) The question required the candidates to explain why some ignition coils are filled with oil. A few candidates explained that it is to cool or give greater heat dissipation.

(d) Candidates answered this question by providing the names of expected components, i.e faulty condenser, contact breaker, spark plug, etc.

(e) Answers such as loss of power, overheated coil, burning of contact points were stated.

Question 4

The sketch below is an engine assembly.



(a) (i) Name the parts labeled U, V, W, X and Y.
(ii) State one function of each of the parts labeled V, W and Y.
(b) Explain how induction is achieved in a four-stroke engine.

(a) (i) The identification of components was done well except a few Candidates who identified U- a rocker arm as a tappet.

(ii) Functions of V, W, and Y, i.e. function of valve, piston and con-rod were well stated.

(b) This question was answered well by majority of candidates, some providing sketches to support their explanations.

Question 5

(a) State three merits of front engine-front-wheel drive.
(b) List three causes of tyre wear.
(c) State three causes of excessive oil consumption in an engine.

(a) Majority of candidates stated the merits well. Majority misunderstood the question and were rather comparing mounting engine in front to mounting engine at the rear.

(b) Majority of candidates listed the causes as expected by the examiner.

(c) A number of candidates listed the causes whilst the rest could not differentiate between fuel consumption and oil consumption therefore stated the causes of excessive fuel consumption and had their answers wrong.

AUTO MECHANIC 3

1. GENERAL COMMENTS

The standard of this year's paper was of the required quality and of the same level with that of the previous year. Candidates' performance was better than that of the past year.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Most of the candidates were able to identify, select and use tools and equipment correctly.
(2) Candidates demonstrated confidence as they executed the assigned tasks and observed the required safety rules and regulations regarding themselves, the tools and the engine provided.
(3) Most candidates carried out the task systematically

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Candidates from some schools did not put on the appropriate workshop clothing such as safety boots and wore sandals instead.
(2) Selection of tools was done by many on a trial and error basis. Some used wrong tools such as ordinary ring spanner for removing spark plug instead of the plug spanner.
(3) Lack of knowledge and skills required for the execution of certain tasks. These included the draining of the engine oil and handling the dip stick correctly when checking the level of oil.
(4) Most candidates had a problem with examining the condition of component parts of the units they work on since they did not know what to check.
(5) Most candidates were unable to identify parts of the units they were questioned on and why certain operations are carried out on them.

4. SUGGESTED REMEDIES

(1) Teachers must regularly help students in the identification of components on a vehicle.
(2) The teachers should have all the necessary tools, equipment and instruments for training the students.
(3) Students must be encouraged to do on-the-job training with established garages and service stations to enhance their practical skills.
(4) Adhering to workshop safety and proper housekeeping should be instilled in students.
(5) Schools should do their best to resource the auto library with modern auto technology books to help students acquaint themselves with modern terms.

5. DETAILED COMMENTS

Question 1

From the cylinder head provided:

(a) remove one spark plug specified by the Examiner. Report to the examiner.
(b) clean the plug. Report to the examiner.

(c) set the plug gap to a value specified by the Examiner. Report to the examiner.
(d) remove one valve indicated by the Examiner. Report to the examiner.
(e) check the condition of the valve. Report to the examiner.
(f) regrind the valve. Report to the examiner.
(g) refit the valve. Report to the examiner.
(h) refit the spark plug. Report to the examiner.

(a) This is a practical task. The most important thing is that the candidate should be able to select the correct and the right tool at a goal.

(b) Cleaning of the plug was a bit difficult for most candidates. The correct tool to use is a pointed flat object made from an old hacksaw blade which should be made pointed and used to clean the insulator surrounding of the centre electrode of the spark plug. Most candidates failed this procedure.

(c) The correct thing to do is to measure the gap between the side and the centre electrode with a feeler gauge. If the gap is incorrect, the side electrode is either bent down or raised to the correct gap where necessary. This task was well undertaken by most candidates.

(d) Valve removal is performed using a valve spring compressor. This was well accomplished by most candidates.

(e) Checking condition of valve: This is done visually, however, many candidates failed to give a good report as they do not know where or what to observe.

(f) Valve grinding: This is done using a paste and stick which is turned to and fro after the application of some daps of grinding paste on the face of the valve. Few candidates faulted in the process of the grinding.

(g) Refitting of valve: This task was easily accomplished by almost all candidate.

(h) Refitting of spark plug: Well achieved by all.

Question 2

From the engine provided:

(a) check the oil level. Report to the examiner.
(b) check the condition of the oil. Report to the examiner.
(c) drain the oil from the sump. Report to the examiner.
(d) remove the oil filter. Report to the examiner.
(e) refit the drain plug. Report to the examiner.
(f) refit the oil filter. Report to the examiner.

(g) refill the engine with oil. Report to the examiner.
(h) check the oil level. Report to the examiner.
(i) answer two relevant questions from the examiner.

(a) This is done by using the dip stick. To check the level of the oil in the sump, the dip stick is held vertically straight to take the reading. Most candidates did it well.

(b) This is done by dipping the finger in the oil then observing its thickness, cleanliness, etc. Most candidates faulted in this process.

(c) Oil is drained by taking off the drain plug from the oil sump. Well attempted by all candidates.

(d) Removal of oil filter. This is done by using an oil filter wrench. Perfectly done by almost all candidates.

(e) Refitting of drain plug. Perfectly done by all.

(f) Refitting of oil filter. Perfectly done by all.

(g) Refilling of engine with oil. Attempted well by all.

(h) Checking of oil level. This is once again done by using dip stick. The dip stick is held straight upright but here again few candidates faulted as they inclined the dip stick when checking the level.

BUILDING CONSTRUCTION 2

1. GENERAL COMMENTS

The paper compared favourably with that of the previous years. It was of the desired quality and adequate for the level of the candidates. The performance of candidates was very low compared with that of the previous year.

2. A SUMMARY OF CANDIDATES' STRENGTHS

Most candidates neatly numbered their questions and produced very neat handwritings.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Most candidates could not spell simple technical terms correctly.
(2) Some could not express themselves meaningfully to put their thoughts across.
(3) Most candidates' responses show that they did not prepare for the examination.

4. SUGGESTED REMEDIES

(1) Candidates should be prepared very well by giving them frequent class exercises, assignments and quizzes before they sit for the examination.
(2) Tutors should organize field trips to construction sites to expose them to the practical aspects of the subject.

5. DETAILED COMMENTS

Question 1

(a) Explain why each of the following types of soil is difficult to use as natural foundation:
(i) clayey soil;
(ii) loose sandy soil;
(iii) rocky soil.
(b) Use a sketch to illustrate a method of preventing subsoil moisture from penetrating through the walls and the floor of a building.

(a) (i) Some candidates were able to mention the behavior of the soil in wet and dry state but could not mention the effect it can cause to the artificial foundation; this include uneven settlement in the soil.

(ii) Most candidates stated the non-cohesiveness of the soil but not the problem associated with the soil as a natural foundation.

This include:
- the tendency to give way under load;
- collapse of sides when excavated for a trench.

(iv) Most candidates stated the right responses.

(b) Most candidates could not produce the correct sketches and labelling to answer the question. The incorrect details produced include:
- hardcore filling going through the wall;
- concrete slab not going through the wall in absence of a damp proof membrane;
- the ground level placed above either the hardcore or concrete slab.

Question 2

(a) Define each of the following terms in relation to stair construction:
- **(i) pitch;**
- **(ii) headroom;**
- **(iii) waist;**
- **(v) flight.**

(b) Illustrate with sketches two methods of fixing a baluster to the tread of a concrete stair.

(c) State two functional requirements of a roof.

(a) Most candidates could not define the terms correctly. The responses were mixed up making it difficult to understand.

(i) Pitch: Is the angle of inclination of a stair to the horizontal.
(ii) Headroom: the minimum free space for easy passage of people, furniture and goods.
(iii) Waist: the effective thickness of the inclined slab that forms a flight of stair, measured from the junction of tread and riser to the stair's soffit.
(iv) Flight: series of uninterrupted steps between a floor and a landing or between two landings.

(b) Two methods of fixing a baluster to the tread of concrete stair were wrongly done. Candidates who attempted the question could not show the tread in concrete but rather timber.

(c) Most candidates were able to state the functional requirements of a roof. Some answers were however jumbled up making it difficult to understand.

Question 3

(a) Use sketches to illustrate each of the following types of wall:
- **(i) buttressing wall;**
- **(ii) retaining wall;**
- **(iii) screen wall.**

(b) List four types of ironmongery used for doors and windows.

(c) State where each of the following doors is suitably used in a building:
- **(i) matchboarded door;**
- **(ii) over-head roller shutter door;**
- **(iii) flush door;**
- **(iv) glazed metal door.**

(a) Most candidates could not answer the question well. The sketches that most candidates produced did not depict or illustrate the types of walls that the question requested them to sketch.

(b) Most candidates were able to mention some of the ironmongery used for door and windows. Some candidates however did not know that nails, bolt and nuts are fastening devices.

(c) Most of the responses provided by candidates were mixed up. Correct responses were provided for the matchboarded door and the flush door. The use of over-head roller shutter as a door was not known by candidates judging from their responses.

It is a door constructed with metal which is folded up to open and rolled down to close. It is used for warehouses, garages and workshops due to its robustness.

Question 4

(a) (i) State three functional requirements of a concrete foundation.
(ii) Sketch the pictorial view of a stepped foundation.

(b) State in sequence, five stages involved in the manual method of manufacturing a sandcrete block after the materials have been batched.

(a) (i) Most of the candidates who attempted this question provided good responses to answer the question.

(ii) Most of the candidates used line diagram instead of a pictorial view to produce the sketch. A few who used two-dimensional drawings could not produce the correct depth and lap.

(b) Most candidates were able to state in sequence the stages involved in manufacturing sandcrete blocks. However, even though the question was clear on already batched materials, some candidates stated batching of materials as a stage.

Question 5

(a) Sketch the conventional symbols for the following in electrical installation works:
(i) fuse;
(ii) meter.
(b) State two functional requirements of a drainage scheme.
(c) Explain two causes of accident during roof construction.
(d) State two precautionary measures to be observed when operating a concrete mixer.

(a) (i) Most candidates could not sketch the symbol for fuse. The correct sketch is a rectangular box with a thin line going through from the left side to the outer side on the right.

(ii) Most candidates were able to sketch the correct symbol for meter.

(b) Most candidates who attempted this question stated correct responses to answer the question.

(c) Most candidates were able to give good responses to explain the causes of accident during roof construction.

(d) Most candidates could not give all the two required answers. Most of the answers centred on protective clothing and shortage of fuel in the concrete mixer.
Some of the required answers include:
- inspecting the machine before use;
- cleaning and oiling of parts;

- ensuring the capacity of the mixer is not exceeded.

BUILDING CONSTRUCTION 3

1. GENERAL COMMENTS

The paper compared favourably with that of the previous year. Candidates' performance saw a bit improvement over that of the previous year.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Answers to questions were specific and straight to the point.
(2) Sketches were of good sizing and readable.
(3) Most candidates numbered their work neatly and spaced out the words very well.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Candidates' expressions and spellings were very poor.
(2) Arrows pointing to labeled items were wrongly orientated.
(3) Candidates do not take their time to read and understand questions very well before they attempt to answer.

4. SUGGESTED REMEDIES

(3) Candidates should be encouraged to read the rubrics and the questions carefully to their understanding before they answer them.
(4) Tutors should give more exercises to candidates to enhance their sketching abilities.
(5) Tutors should demonstrate and encourage candidates to practice the correct methods of labelling with arrows.

5. DETAILED COMMENTS

Question 1

Fig. 1 shows a section through a two-storey classroom block built on a moderately firm soil. The foundations are pad and ordinary strip for the columns and the non-load bearing brickwalls respectively. The roof is covered with plain burnt clay tiles.

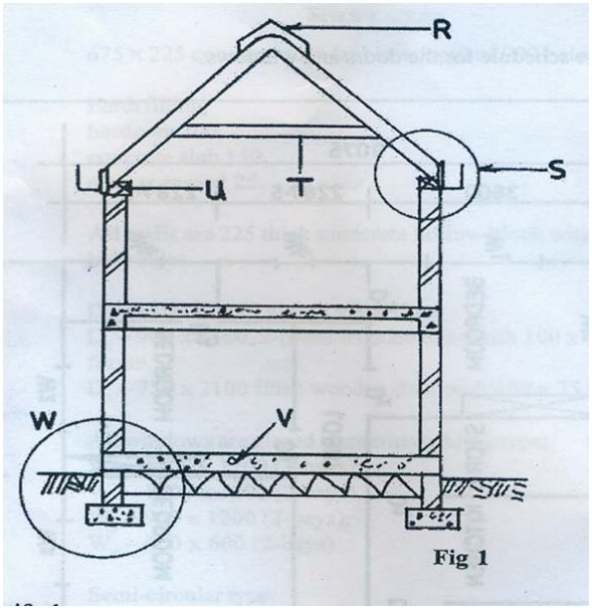


Fig 1

(a) **Identify the:**
- **(i)** **type of roof;**
- **(ii)** **elements labeled R, T, U and V.**

(b) **(i)** **Sketch a cross section through a suitable timbering system for supporting the sides of the foundation trenches.**

(ii) **Label four parts of the sketch.**

(c) **Sketch the constructional detail at W from the pad foundation to the ground floor level and label the following parts:**
- **(i)** **pad foundation;**
- **(ii)** **starter column;**
- **(iii)** **steel reinforcement in pad foundation;**
- **(iv)** **starter bars.**

(d) **State:**
- **(i)** **three advantages of the manual method of excavating the trenches over the mechanical method;**
- **(ii)** **five characteristics of the burnt clay bricks used for constructing the walls.**

(e) **Sketch the constructional details at S and indicate the following parts:**
- **(i)** **rafter;**
- **(ii)** **roof batten;**
- **(iii)** **fascia board;**
- **(iv)** **wall plate.**

(f) **State two precautions to be observed when placing the concrete for the pad foundation.**

A compulsory question and as such attempted by all candidates.

(a) (i) Most candidates could not identify the type of roof correctly. The correct roof is collar roof.

(ii) Most candidates identified element 'U' as oversite concrete instead of wall plate.

(b) A very popular question for candidates. The question was well answered by candidates.

(c) Most candidates performed poorly with this question. Candidates sketched ordinary strip foundation instead of the pad foundation requested by the question.

(d) (i) Candidates could not answer this question well. Candidates seemed not to have read much on the topic. The required answers include:
- more economical for small jobs;
- lower risk of accident;
- no need for fuel and lubricant to power.

(ii) Characteristics of burnt clay brick:
- Clay are durable;
- It is sound in quality;
- It has good fire resistance.

(e) Most candidates could not produce the required sketches and labelling to answer the question.

(f) A few candidates gave good responses to answer the question. Many others however deviated and gave wrong responses.
The required answers include:
- the base should be leveled and tamped to eliminate weak spots;
- the surface of the natural foundation should be blinded to prevent contamination of the concrete.

Question 2

(a) Sketch a ledged and braced matchboarded door and label the following parts:
(i) top ledge;
(ii) brace;
(iii) batten;
(iv) bottom ledge.

(b) State three reasons of giving the door a glossy oil paint finish when used as an external door.

(c) Describe how the following are stored on a building site:
(i) reinforcement rods;
(ii) clay bricks;
(iii) wooden door frames.

(a) Most candidates who attempted the question did very well. They produced the required sketches.

(b) Candidates stated the required answers correctly.

(c) Most of the candidates stated reasons or the 'why' aspect of the question instead of 'how' which the question demanded.
The required answers include:
- should be stored according to diameter, length and type.
- be stored according to type.

Question 3

(a) State:
(ii) four functions of a non-load bearing wall;
(iii) three types of failure which occur in a retaining wall.

(b) List:
(i) five parts of an inspection chamber in a drainage system;
(ii) six methods of testing underground drainage lines.

(a) (i) Majority of candidates who attempted the question stated the required answers correctly.
(iii) Most candidates could not list the failures in retaining walls adequately.
The required answers include:
Sunking, cracking, sliding and over turning.

(b)&(c) Most candidates who attempted these questions answered them very well.

Question 4

(a) List four methods of curing concrete in a ground floor slab.

(b) With the aid of a sketch, describe a method of preventing subsoil moisture from rising to top surface of a ground floor slab of a building on a raft foundation.

(c) Explain four reasons for placing hardcore filling under a ground floor slab.

(a) Candidates did very well with this question.

(b) Most candidates sketched a section through solid ground floor instead of raft foundation concrete. The question was poorly answered.

(c) Majority of candidates who attempted the question stated the required reasons correctly.

Question 5

(a) (i) Explain the difference between common bricks and facing bricks in relation to sandcrete blocks.

(ii) State two areas each, where each of the bricks in (i) above is used in construction.

(b) State six stages involved in casting a suspended hollow block concrete floor.

(c) A concrete lintel is used to bridge an opening in a cavity brickwall. Sketch a section through it and label the following:
(i) concrete lintel;
(ii) damp proof course;
(iv) cavity wall tie;
(v) outer leaf of cavity.

(a) (i) The question was not popular at all among candidates. The few who attempted it could not answer it well. The required answer is:
- Common bricks have broken arises or edges. They are not attractive.
- Facing bricks have good edges, sharp arises and has reasonable resistance to exposure.

(b) Candidates could not answer the question well. Their responses lacked the technical facts needed. The required answers include:
- checking the vertical and horizontal alignment of the formwork;
- placing of services conduits in position;
- placing the hollow blocks in position.

(c) Most candidates produced the elevational sketch instead of a sectional sketch demanded by the question.

Question 6

(a) State:
(i) four responsibilities of a clerk of works at a construction site;
(ii) two factors which discourage the use of the indirect cold water supply system in a domestic building;
(iii) two reasons for providing circuit breaker in an electrical installation work;
(iv) two factors that influence the choice of internal dimensions of an inspection chamber.

(b) Sketch a representative symbol for each of the following lines in building drawing:
(i) hidden;
(ii) dimension.

(a) (i) Candidates who attempted this question produced good responses.

(ii) Candidates could not answer the question well. They exhibited poor knowledge in the topic. The required answers include:
- high risk of water contamination;
- additional cost to provide access to the cistern;
- the need to ensure that the cover is secured firmly to the reservoir;

(iii) Candidates performed poorly in their responses to this question. The required answers include:
- to protect circuits from excess current;
- to prevent fire hazard in the circuit;
- to prevent the equipment from damage.

(b) Most candidates who attempted this question produced good sketches to answer the question.

ELECTRONICS 2

1. GENERAL COMMENTS

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

The overall performance compared with that of the previous years was generally fair.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Some of the candidates had indepth knowledge of magnetism.
(2) Majority of the candidates were able to recall formulae correctly.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Majority of the candidates did not demonstrate knowledge and understanding of electronics.
(2) Most of the candidates did not answer their questions satisfactorily.
(3) Most of the candidates did not understand the questions properly.
(4) Most of the candidates did not prepare adequately for the Electronics paper.

4. SUGGESTED REMEDIES

(1) Candidates should be taught the techniques of answering questions.
(2) Candidates should read widely on Electronics textbooks and periodicals to broaden their knowledge in the subject.
(3) Some recommended textbooks (Electronics) should be made available to students.

5. DETAILED COMMENTS

Question 1

(a) Distinguish between analogue meter and digital meter.
(b) State the function of the following controls used in the cathode ray oscilloscope (CRO):
(i) focus;
(ii) Y-shift;
(iii) X-shitf;
(iv) intensity.

(a) Candidates' response to the question was average. Analogue meter has a pointer moving across a calibrated scale. It is used to measure voltage, current and resistance. Whereas Digital meter performs the same functions as Analogue meters but displays the indicated value using a segmented LED to give a numerical value.

(b) Majority of the candidates could not respond to this question. The appropriate responses are:

(i) FOCUS CONTROL: It adjusts the spot or trace for a sharp image.
(ii) Y-SHIFT: It moves the sport or trace vertically upwards or downwards.
(iii) X-SHIFT: It moves the sport or trace to the left or right positions.
(iv) INTENSITY: Adjusts/controls the brightness of the CRO (high or low) of the trace/spot.

Candidates' performance in this question was poor.

Question 2

Using figure 1, calculate:
(i) Voltage drop across the resistors;
(ii) I_1;
(iii) I_2;
(iv) The power dissipated in the circuit.

Majority of the candidates could not respond to this question. The appropriate responses are as follows:

(i) $V = 1.5V + 1.5V = 3V$ (parallel connection)

(ii) $I_1 = \frac{V}{R_1}$

$= \frac{3V}{6\Omega} = 0.5A$

(iii) $I_2 = \frac{V}{R_2}$

$= \frac{3V}{3\Omega} = 1A$

(iv) Power W = VI_T
= V x (I_1 + I_2)
= 3 x 1.5
= 4.5W

Performance of candidates was poor.

Question 3

(a) Define secondary emission.
(b) List any TWO anodes of a cathode ray tube.
(c) State two parameters of a triode valve.
(d) Draw and label the symbol of EACH of the following:
(i) Directly heated cathode triode valve;
(ii) Indirectly heated cathode triode valve.

(a) This question was not popular amongst the candidates. Secondary emission is the liberation of electrons from an element other than the cathode of a valve by high velocity electrons.

(b) This question was not unpopular amongst the candidates. Any two anodes of a cathode ray tube:
(i) Focus anode (ii) Accelerating anode
(iii) Final anode (iv) First anode (v) Second anode

(c) This question too was not popular among the candidates. Two parameters of a triode valve:
(i) gm = transconductance
(ii) μ = amplification factor
(iii) γa = anode resistance

(d) Most candidates could not respond very well to this question.
Performance of candidates was poor.

Question 4

(a) Define the following terms:
(i) Magnetic flux density;
(ii) Electric flux density;
(b) State the units for each in 4(a)(i) and (ii).

(c) A coil has a flux density of 0.2T and a cross-sectional area of 4 x $10^{-4}m^2$. Calculate the total flux in the core.

(a)&(b) Candidates' response to this questions was poor. Some few candidates were able to define magnetic flux density and electric flux density correctly and state the units for each quantity.

MAGNETIC FLUX DENSITY – Magnetic lines of force per unit area within a substance through a plain at right angle to the flux.

ELECTRIC FLUX DENSITY - The number of electric lines of force passing through a given area.

(b) (i) Units - Weber/m^2 or Tesla
(ii) Units - Coulomb/Square meter

(c) This was a popular question amongst candidates. Majority of the candidates were able to respond to this question.
Candidates' performance in this question was generally fair.

Question 5

(a) Draw:
(i) differentiating circuit;
(ii) integrating circuit.
(b) Draw the frequency response curve for each of the circuit in 5(a).

(a) Majority of the candidates could not draw the differentiating and integrating circuits.

(b) This question was not popular amongst the candidates. Majority of the candidates could not draw the frequency response curve in 5(a).
Performance of candidates in this question was very poor.

Question 6

(a) State the functions of the following in a TV receiver:
(i) Luminance amplifier;
(ii) Sync. Separator;
(iii) Field time base oscillator.
(b) State FOUR blocks in a superheat receiver that are common to radio and TV receivers.

(a) Candidates' response to the question was very poor. Majority of the candidates could not state the functions of the units in (a).

(i) Luninance Amplifier – a stage in which the video or black and white signal is amplified.

(ii) Sync Separator - A stage in which the sync pulses is separated from the video signal.

(iii) Field Time base oscillator - A stage in which the vertical frequency is produced or generated.

(b) This question was not popular amongst candidates. Four blocks in a superheat that are common to radio and TV receivers are:

(i) Automatic gain control;
(ii) Local oscillator
(iii) IF amplifier block;
(iv) Mixer block;
(vi) RF Amplifier block;
(vii) Sound amplifier block;
(viii) Demodulator block.

Candidates' performance was poor.

Question 7

(a) Draw the block diagram of a simple closed-loop control system.
(b) State the conditions for stability in a closed-loop control system.

(a) This question was not popular amongst the candidates.

(b) This question was not popular amongst the candidates. The appropriate response(s) are:
Gain (GH) must not be equal to 1 when the phase angle of Gain (GH) is 180º.
Candidates' performance was fair.

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 years 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 used in drawing good graphs.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Few candidates wasted time by providing irrelevant information not demanded by the rubrics.
(2) Few candidates attempted in changing the measured voltages into millivolts which was not demanded in the rubrics.

4. SUGGESTED REMEDIES

(1) Candidates should read thoroughly the rubrics before attempting the questions.
(2) Supervisors should explain clearly the basic safety precautions in the performing practical experiments.

5. DETAILED COMMENTS

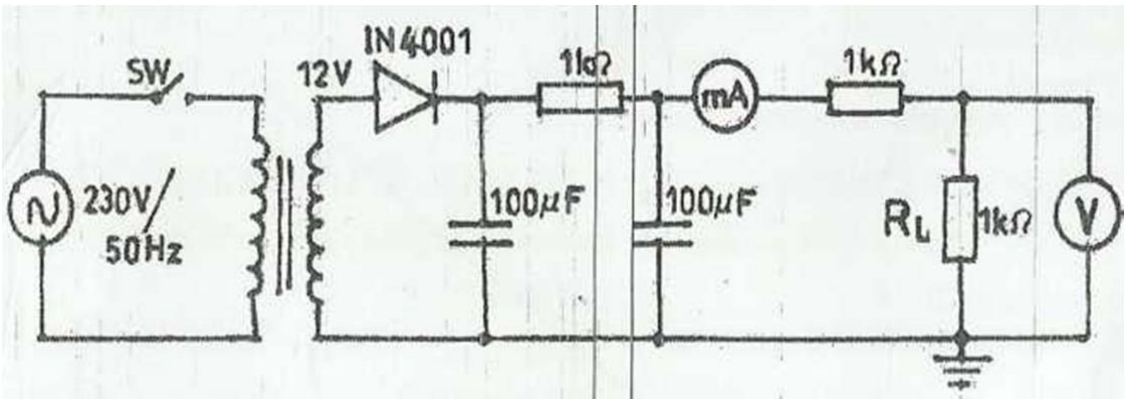
You are provided with the following apparatus:

one stepdown 12 V transformer;
one zener diode 6 V (BZY 88) or its equivalent;
one (0 – 10 mA) milliammeter;
one (0 – 20 V) voltmeter;
two 100 µF, 25 VW capacitor;
one In 4001 diode or its equivalent;
three 1 kΩ, ¼ W resistor;
one 2.2 kΩ, ¼ W resistor;
one 3.3 kΩ, ¼ W resistor;
one 4.7 kΩ, ¼ W resistor;
one 6.8 kΩ, ¼ W resistor;
one 8.2 kΩ, ¼ W resistor;
one 10 kΩ, ¼ W resistor;
one toggle switch;
one soldering iron with resin-cored solder;
veroboard/Quick test board;

connecting wires;
Long nose pliers;
side cutter.

Question 1

AIM: To determine the effectiveness of stabilization of a half-wave rectifier.



(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

R_L(kΩ)	V(V)	I(mA)
1.0		
2.2		
3.3		
4.7		
6.8		
8.2		
10.0		

(d) Close switch (sw).
(e) Read and record in Table 1, the voltage (V) and current (I) readings.
(f) Open switch (sw) and replace the 1 kΩ resistor (R_L) with 2.2 kΩ resistor.
(g) Repeat steps (d) and (e).
(h) Repeat steps (f), (d) and (e) for the other values of R_L in Table 1.
(i) Open switch (sw).
(j) Using Table 1, plot a graph of voltage (V) on the vertical axis against current (I) on the horizontal axis.

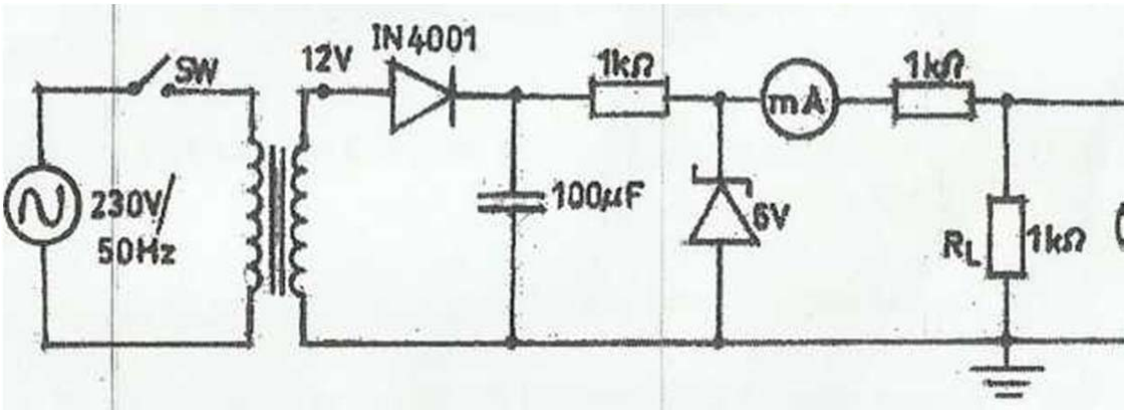
The experiment tested the effect of changing the values of load resistance against output voltage and current respectively.

Majority of the candidates used the results obtained to draw good graphs.

Performance was generally good.

Question 2

AIM: To determine the effect of zener diode on stabilization of a half-wave rectifier output.



(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

R_l(kΩ)	V(V)	I(mA)
1.0		
2.2		
3.3		
4.7		
6.8		
8.2		
10.0		

(d) Close switch (sw).
(e) Read and record in Table 2, the voltage (V) and current (I) readings.
(f) Open switch (sw) and replace the 1 kΩ resistor R_L with 2.2 kΩ resistor.
(g) Repeat steps (d) and (e).
(h) Repeat steps (f), (d) and (e) for the other values of R_L in Table 1.
(i) Open switch (sw).
(j) Using Table 1, plot a graph of voltage (V) on the vertical axis against current (I) on the horizontal axis.

(k) Compare the two graphs drawn in Questions 1 and 2, and deduce the effectiveness of stabilization of the output voltage with and without the zener diode.

The experiment tested the effect of zener diode and the change of values for load resistance on output voltage and current respectively.

Few candidates failed to obtain the exact pattern of the graphs.

Performance of the candidates was generally good.

INFORMATION AND COMMUNICATION TECHNOLOGY(ELECTIVE) 2

1. GENERAL COMMENTS

This paper was the first Information and Communication Technology (ICT) Elective examination taken by Senior High School candidates in Ghana. The questions set were standard and within the scope of the syllabus.

The general performance of the candidates' was poor.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Most candidates responded to the question as demanded by the rubrics.

(2) Few candidates exhibited good knowledge of the subject matter.

(3) Some candidates expressed themselves very well in the English Language.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

The candidates' weaknesses identified include:

(1) Following simple instructions as to how to use the answer booklet by some candidates was an issue. Answers to sub-questions were scattered all over, making it very difficult for the examiner to trace the sequence of answers.

(2) With the English language, not only were some of the candidates making serious grammatical and spelling errors, but also not being able to construct any meaningful sentences. There were so many incomplete sentences.

(6) Some candidates demonstrated that they were poor in mathematics. Systematic answering of questions by some candidates was just too poor.

(7) Handwriting by most of the candidates' was just ineligible.

(8) Some candidates demonstrated in their answers that they have *little or no knowledge* of the examination syllabus.

(9) Inability of candidates to write horizontally on the line provided for them on the script.

4. SUGGESTED REMEDIES

(1) Candidates should be taught in class to use the answer booklet. They should be encouraged to answer sub-questions sequentially.

(2) Candidates should be encouraged to construct meaningful sentences.

(3) Candidates writing **ICT Elective** should also offer elective mathematics, since they are supposed to apply it in ICT. They should be told that mathematics is a prerequisite for good understanding of ICT.

(4) Candidates should be encouraged/ taught to answer questions systematically.

(5) Candidates should be reprimanded for ineligible handwriting, to enable them improve on their handwriting.

(6) Teachers should use the ICT Elective syllabus, and, make it their first point of teaching in the schools.

5. DETAILED COMMENTS

Question 1

(a) (i) List the basic components of a *decision support system*.

(ii) Draw a diagram showing how the basic components in (i) above interact among themselves.

(b) In the context of decision support systems, state the difference between a special purpose and general purpose planning language.

(a) (i) Candidates gave varying answers to the question which were wrong. Some candidates listed "strategic level", "management level" and "operational level" as components of Decision Support System (DSS),

which was totally wrong.

Strangely, some candidates listed components of a computer as components of Decision Support System (DSS),

(ii) Candidates were required to draw a diagram showing how the basic components of Decision Support System (DSS) listed in 1(a)(i) interact among themselves.

Candidates gave varying diagrams which were far different from what was expected of them. Some diagrams were not properly labelled. In some, the interactive arrows were missing. Others could not write anything at all.

The candidates' performance was poor.

(b) Candidates gave similar answers but majority failed to mention the word "problem" which was a key word in the answer.

The candidates' performance was poor.

Question 2

(a) What is *Desktop Publishing*?
(b) In the context of desktop publishing, list four:
(i) elements of design;
(ii) principles of design.
(c) Explain the term *imposition* in desktop publishing.

(a) In answering this question, candidates were expected to list the phrases "creation of documents", "page layout skills with computer", and "use of appropriate program".

Majority of candidates who attempted this question lost marks because they failed to use the phrase "page layout skills with computer" in their answers.
Some candidates ended up describing the "desktop computer "instead of Desktop publishing.

Majority of the candidates made bold attempt to answer this question, but ended up losing marks because of incomplete sentences and poor spelling of technical terminologies.

Their performance was below average.

(b) Candidates were required to list the "*elements*" and "*principles*" of design.

Some candidates interchange the answers for elements of design with principles of design or mixed them up. The elements of design listed by candidates were nowhere near the expected answers. Candidates were seriously beating about the bush. Others also made a lot of spelling mistakes.

The same can be said of principles of design. Some candidates listed the names of software applications as principles of design. Some candidates could not write even a word.

Candidates' performance was poor.

(c) Majority of candidates who attempted this sub-question could not just define the word “imposition” correctly. Some defined it as “the improper positioning of elements of design” which was totally wrong.

In general, question two(2) was the most popular question among candidates but performance was poor.

Question 3

(a) Explain *low level* language.
(b) Describe
(i) machine language;
(ii) assembly language.

(a) Candidates were expected to give a general definition of a low level language and state that “Machine Language” and “Assembler” are examples of low level language.

Majority of candidates could not just explain what a low level language is.

(b) Candidates were required to describe “machine language” and “assembly language”.

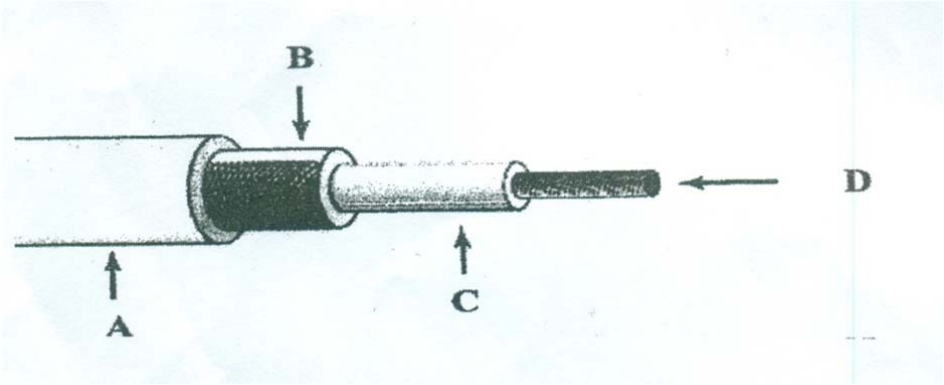
The least expected of candidates was to write that “machine language makes use of binary numbers as instructions to control the processor in the computer” and “assembly language make use of mnemonics as a way of instructing the processor in the computer”.

Only a few candidates were able to do this.

Candidates’ performance was very poor.

Question 4

(a) Label the coaxial cable below.



(b) State two disadvantages of each of the following network media.

(i) twisted pair;

(ii) fibre optic;

(iii) wireless (unguided media).

(a) Candidates were expected to use the following words like "Outer insulation/ outer shield", "wire mesh", "Inner insulation" and "Center wire/ Conducting core" in the labeling of the parts of the coaxial cable.

Some few candidates got this question right. It was very strange to see candidates labeling the coaxial cable with the names of other transmission media/cable. Some label part A as "fiber optics", part B as "coaxial cable", part C as "twisted pair and part D as "copper cable", which was totally wrong. Some candidates could not differentiate the word "cable" from "wire". They were just interchanging the words.

Candidates' performance was poor.

(b) Candidates were required to state the *disadvantages* of three different transmission media namely "twisted pair", "fiber optic" and "wireless (unguided media)".

For twisted pair, candidates were expected to list "Susceptible to Electro Magnetic Induction, Radio Frequency Interference and noise", "Attenuation" and "relatively low bandwidth".

For Fiber Optic, candidates were expected to list "Expensive over short distance", "required highly skilled installers" and "adding additional nodes is difficult".

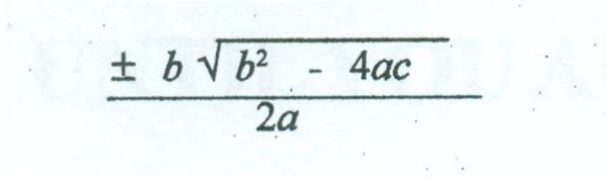
For wireless, candidates were expected to list "high initial cost of setup", "expensive towers and repeaters required", "susceptible to interference", "propagation delay", and "security risk".

Majority of candidates failed to list most of the disadvantages mention above. Strangely, some candidates were rather listing the advantages of the transmission media instead of the disadvantages.

Candidates' performance was very poor.

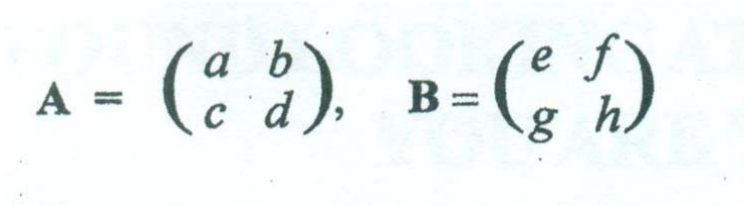
Question 5

(a) Write the BASIC expression for the following mathematical notation:



$$\frac{\pm\ b\sqrt{b^2\ -\ 4ac}}{2a}$$

(b) Write the BASIC expression for the product of the two matrices A and B.



$$\mathbf{A} = \begin{pmatrix} a & b \\ c & d \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} e & f \\ g & h \end{pmatrix}$$

(a) Candidates were required to write the BASIC language expression for a mathematical notation. The expected solution is as given below:

"(b+SQR(b*b-(4*a*c)))/2*a" or "(-b+SQR(b*b-(4*a*c)))/2*a" .

Some candidates solved the quadratic equation, using their own variables as supposed to be in "mathematics" and not in BASIC programming. Some candidates failed to observe the rules of "BODMAS" in the process of writing the expression in BASIC, so lost marks. Others mistakenly wrote the expression for a spreadsheet instead of BASIC.

(b) Candidates were required to write the BASIC language expression for the product of two square matrices. Expected solution is as given below:

$$\begin{Vmatrix} a*c+b*g & a*f+b*h \\ c*e+d*g & c*f+d*h \end{Vmatrix}$$

Most candidates who attempted this question got it wrong.

They failed to use the BASIC symbol * for multiplication. They rather used the mathematical symbol "x", which was wrong. Some candidates also demonstrated they had no knowledge of matrix multiplication in mathematics and therefore were not able to write it in BASIC too.

Candidates' performance was very poor.

INFORMATION AND COMMUNICATION TECHNOLOGY(ELECTIVE) 3

1. GENERAL COMMENTS

This paper was the maiden Information and Communication Technology (ICT) Elective examination taken by Senior High School candidates in Ghana. The questions were of standard and within the scope of the syllabus.

Candidates' general performance was poor.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Candidates who presented work were able to enter data.
(2) Majority of the candidates responded to the demands of the question as demanded by the rubrics.
(3) Most of the candidates had good knowledge in HTML tags.
(4) Most candidates attempted to answer the required number of questions.

3. A SUMMARY OF CANDIDATES' WEAKNNESSES

(1) Some candidates presented blank CDs.

(2) A significant number of candidates used Microsoft Excel instead of Microsoft Access for the database application.

(3) Most candidates failed to use the header facility in the table.

(4) Candidates were unable to create the database query.

(5) Candidates avoided answering the programming questions (i.e. HTML and BASIC).

(6) Candidates did not understand *output*. It appears that, to most of them it simply means *print* and thus they submitted printed source code not even printed formatted output resulting from running the source codes.

(7) Candidates' approach to saving with appropriate file names was bad. They mixed up filenames and their contents.

(8) Candidates do not have good logical reasoning skills which are crucial to program flow control.

4. SUGGESTED REMEDIES

(1) Candidates should be advised to study and acquire basic concepts and logical reasoning skills to succeed in ICT.

(2) Teachers must cultivate logical reasoning skills in candidates.

(3) Teachers must pay attention to the syllabus. They must stress on technical approach in teaching ICT.

(4) Teachers must be mindful of the books they use for teaching as some may contain errors and the candidates might have been fed with these errors.

(5) 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.

(6) Teachers in their preparation of examination should expose candidates to more practical ICT test.

5. DETAILED COMMENTS

Question 1

DATABASE

This was a question on database application for candidates to create a schema. In this schema they were expected to create a table and a query.

A number of candidates used Microsoft Excel for this work. This was a deviation from the requirement of using a database application such as Microsoft Access. In an instance, a candidate saved data entered in Excel as an html file and used it as his created database table which was wrong.

For candidates who worked in Access, the requirement is to first and foremost save the schema as SCORE. This is a file and not a folder as some candidates presented. It is also the requirement of the question to save the table populated with data as shown in the question as TBLSCORE. Table TBLSCORE *must* contain exactly that information *ONLY*. Almost all candidates added extra field – *Average* and *Comment.*

The emphasis of the question is on "a" query, not queries. The only way the query can be stored in one file is to use the Microsoft Access Query Design which produces query results based on table TBLSCORE.

The query result in QRYANALYSIS *must* contain the extra fields, *Average* and *Comments* and their respective analyzed values*,* in addition to the fields in TBLSCORE. The data table TBLSCORE *must* remain as shown in the question without including the *Average* and *Comments* fields at the conclusion of the entire work.

This query, when successfully created using Microsoft Access Query Design in the Microsoft Access application, when viewed in SQL View will produce a single SQL query for this task as shown below:

```
SELECT TBLSCORE.[Student Name], TBLSCORE.Theory, TBLSCORE.LabWork, TBLSCORE.FieldWork,
([Theory]+[LabWork]+[FieldWork])/3 AS Average, IIf(Average>79,"Above Average",IIf(Average>49
And Average<80,"Average Student",IIf(Average<50,"Below Average","UNDEFINED RANGE"))) AS
Comment FROM TBLSCORE;
```

After creating the table TBLSCORE, this SQL query can be typed back into Microsoft access Query Design SQL View and looked at from the Design View for candidates' appreciation.

Some candidates used the table column headings as data and left the default column name "field".

Other candidates also saved TBLSCORE and QRYANALYSIS as separate databases instead of saving them as tables and query respectively in the database schema SCORE.

Performance was average.

Question 2

HTML

The question required candidates to create an html web page. Majority of candidates were not able to do this. A sample solution is as given below.

```
<!DOCTYPE html>
<html>
<head>
<title>
      candidate's name   candidate's index number
</title>
</head>
<body>
         <p>
                  This is <b>paragraph 1</b>
         </p>
         <p>
                  This is <u>paragraph 2</u>
         </p>
         <p>
                  This is <i>paragraph 3</i>
         </p>
         <input type="button" value= "Print">

 <!-- OR -->
        <input type="submit" value= "Print">
</body>
</html>
```

While some candidates produced the bold text 'paragraph 1' using the tag, others used the tag. This same scenario applies to the use of and tags to produce italics text. Candidates are admonished that the two will produce the same result in terms of look on screen but are not the same in usage and should be careful in their usage.

Some candidates saved the file as *PARAGRAPH.HTML.html*. Candidates should be mindful of automatic appending of file type extensions by editors.

The closing of html tags leave much to be desired. Some candidates' not closing of tags for example ended up having all remaining text in bold.

Few candidates used MS Word to solve this question, saving the work as word documents instead of html.

This question on html is the one in which few candidates scored full marks.

Question 3

QBASIC

Candidates were not able to carry out this work except for an exceptional few. The following is a basic outline pseudo code for solving the problem.

```
DECLARE VARIABLES
OPEN OUTPUTFILE(INTEREST) FOR OUTPUT
FORMAT HEADER FOR OUTPUT
```

OUTPUT HEADER TO OUTPUTFILE
CLEAR SCREEN
START LOOP TO READ INPUTS VARIABLES (LOOP FOR AT LEAST 2 TIMES – 1 FOR EACH ACCOUNT TYPE)
LIST OPTIONS FOR INPUTING ACCOUNT TYPE
READ INPUT VARIABLES
TEST FOR ACCOUNT TYPE
ASSIGN INTEREST RATE
COMPUTE INTEREST
DISPLAY INTEREST
FORMAT OUTPUT VALUES (SAVING AND CURRENT A/C)
OUTPUT TO OUTPUTFILE(INTEREST)
SET LOOP TEST VALUE (TO CONTINUE OR TO EXIT)
CLEAR SCREEN
END LOOP
CLOSE OUTPUTFILE
Exit

In general, candidates declared the required variables as INTEGER data types. Account number could be INTEGER or preferably be of type string since there could be preceding zeros depending on implementation. Principal cannot be of type integer but double. Rate also cannot be of INTEGR data type but double. Time can be of type integer when reduced to discrete time such as months.

Candidates who went beyond declaring of variables mostly can be said not to know what exactly they were about.

Candidates could not implement outputting to file INTEREST. They were saving their codes as INTEREST instead of B_DEPOSIT.

Majority of candidates had zero for this question. Performance was bad.

METALWORK 2

1. GENERAL COMMENTS

The standard of the paper was the same as that of the previous year. The performance of candidates was generally average.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Candidates could answer the required number of questions.
(2) Some candidates provided good answers.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Majority of the candidates could not provide the required responses.
(2) Sketches provided by some candidates were not good.

4. SUGGESTED REMEDIES

(1) Candidates should be helped by tutors to complete the teaching syllabus.
(2) Candidates should be given more activities involving sketches.

5. DETAILED COMMENTS

Question 1

(a) State two routine maintenance practices to be carried out on the lathe.
(b) List two constituents each of the following metals:
(i) brass;
(ii) solder;
(iii) duralumin.
(c) List three materials that are used in the cupola to produce cast iron.
(d) List two abrasives used for polishing metals.

(a) Performance was good since majority of the candidates could provide the two routine maintenance practices.

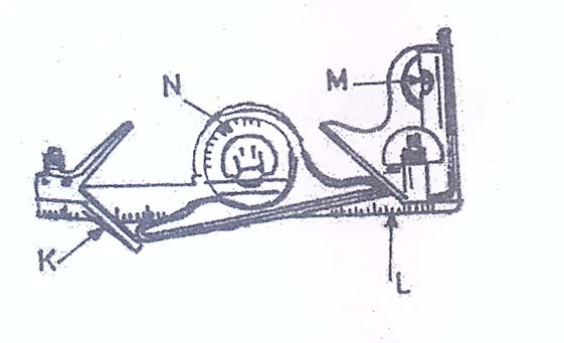
(b) Candidates could list two constituents each of brass (i.e copper and zinc), solder (i.e. lead and tin) and duralumin (i.e aluminium, copper, manganese and magnesium).

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

(d) Candidates could not list two abrasives. The abrasives include: emery cloth, calico mop and solid felt mop.

Question 2

The sketch shown below is a hand tool.



(a) (i) Identify the tool;
(ii) Identify the parts labelled K, L, M and N.
(iii) State one use each of the parts labelled K and N.
(b) State three steps involved in the process of case-hardening a mild steel.

(a) (i) Candidates were able to identify the sketch shown (i.e combination set).

(ii) The parts labelled K, L, M and N are:
Centre square, rule, spirit level and protractor respectively.

(iii) Majority of the candidates could not state one use each of the parts labelled K and N. The uses include: K-for finding the centre of a circular piece and N-for marking out or measuring an angular surface.

(b) Majority of the candidates could not state the three steps involved in the process of case-hardening mild steel.

Question 3

(a) State the difference between the following:
(i) parting sand and facing sand;
(ii) backfire and flashback in oxyacetylene welding;
(iii) lacquering and painting.
(b) Explain how allowance for contraction is provided on a pattern for sand casting.
(c) Sketch the following hand forging tools:
(i) fuller;
(ii) flatter.

(a) This was not a popular question. Those who attempted this question could not provide good responses.

(i) Facing sand is used around the cavity while parting sand is used to separate the contents of cope and drag.

(ii) Backfire occurs when the flame momentarily burns back into the torch and makes a popping sound while a flashback occurs when the flame passes right through torch and into the hose due to the absence of the fuel gas in the system. Candidates could provide these responses satisfactorily.

(iii) Some candidates could not attempt this part of the question.

(b) Majority of the candidates could explain this process. The pattern is made slightly larger than the actual size of the workpiece.

(c) The sketches of both fuller and flatter were not very good.

Question 4

(a) (i) What is self-secured joint?
(ii) List four examples of self-secured joints.
(b) Explain the term tinning the bit.
(c) State one defect in a butt welded joint.
(d) List three tools and equipment required for forming a shallow bowl in beaten metalwork.

(a) (i) Majority of the candidates answered this question and explained a self-secured joint as a joint that is held together without being riveted, soldered, welded or screwed.

(ii) Majority of the candidates could list four examples of self-secured joints to include: folded seam, grooved seam, circular folded, circular folded seam/knock-down.

(b) Performance on this part of the question was very good.

(c) Candidates could state one defect in a butt welded joint.

(d) The listing of three tools and equipment was correctly done.

Question 5

(a) Sketch and label the following on a lathe cutting tool.
(i) rake angle;
(ii) clearance angle;
(iii) tool angle.
(b) Explain the difference between loading and glazing of a grinding wheel.
(c) State two uses of combination centre drill.
(d) State two reasons for the use of working drawings in design.

(a) Majority of the candidates could not sketch and label the parts.

(b) The performance was not satisfactory. The expected response was that loading in the situation where the wheel has been used to grind soft metals and small particles have become blunt as a results of the bond not releasing the blunted grits.

(c) The combination centre drill is used for starting holes on the lathe where centre punching is not possible. It can also be used for drilling holes into which lathe centres will fit. Most candidates attempted this question and scored good marks.

(d) Candidates did not perform well on this question. The reasons will include: to describe the shape of the assembled unit; To identify each component part of the unit. The supply a list of parts, to act as a source of reference.

METALWORK 3

1. GENERAL COMMENTS

The performance of candidates in this year's examination was generally quite satisfactory and could equally be compared with those of previous years.

Candidates showed high level of competency and proficiency as regards the execution of the expected exercise.

The standard of the paper was suitable for the level being tested. Standard of the paper had been maintained; instructions or rubrics were clear and were given to facilitate the discharge of the test.

2. A SUMMARY OF CANDIDATES' STRENGTHS

Some commendable features observed in candidates' finished products included candidates' ability to

(a) interpret the working/detailed drawing covering the exercise to be produced.
(b) select or choose appropriate tools and equipment to perform the exercise.

(c) apply correct methods to cut to shape prior to filing.
(d) drill parts where required successfully.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

Candidates' weaknesses included the following:

(a) poor adherence to relevant safety factors and measures in the performance of the work.
(b) dimensional control and maintenance was very poor; the entire work was assessed on the finished work dimensions. Candidates could not produce accurate dimensions – dimensions produced far exceeded the given tolerance. It was important for all candidates to work closely to the specified dimensions to obtain the maximum mark.
(c) In most cases, the finished work which candidates submitted could not be dismantled to facilitate marking.
(d) Many candidates failed to perform the radiusing of the corners of the internal features of the assembly; this resulted in the loss of remarkable marks and therefore affected candidates' general performance.
(e) Many candidates failed to assemble all the finished work.
(f) Finished products were not safe to handle - filed edges and cuts remained sharp and dangerous.

4. SUGGESTED REMEDIES

(a) Students should be encouraged to adopt good working practices.
(b) Candidates should be made to learn and appreciate theoretically the general workshop safety rules and regulations.
(c) Candidates should learn and apply various marking out methods to scribe the work profile on the metal before cutting out to shape.
(d) Candidates should not use hammer to assemble parts but should use mallet to reduce the instances of riveting pins and dowels in the assembly.
(e) Students should be given sufficient practical exercises including radiusing of corners or the like to offer candidates with the needed exposure and experience.
(f) Candidates should learn to remove swarfs and burrs on the finished work.

5. DETAILED COMMENTS

TEST A:

Candidates were supplied with the following materials:
One flat mild steel plate, 110 mm x 72 mm x 3 mm – 2 off; dowel pin – Ø3 x 6 mm – 2 off to produce the item shown in the assembly by using the detailed or working drawings indicated in Part 1, Part 2, Part 3 and Part 4.

Candidates were expected to mark out Part 1 and Part 2 profiles per the given dimensions on one of the 110 mm x 72 mm x 3 mm plates. Candidates were expected to dot-punch these profiles previously marked out for clearer and more visible shapes.

The parts dot-punched should be cut with hacksaw carefully through the visible lines forming the shape. The internal portions of the profiles could be drilled and chiseled.

After cutting, the remaining material could be carefully filed first with rough file and finally finished with smooth file.

Part 3 – marked out, dot-punched and cut out to shape could be filed to the required shape.

After obtaining the desired shapes, all the parts should be assembled together using hand vice and drilled through at the centre punched positions for the two dowel pins.

It was observed that in most cases candidates failed to mark out the profile of the detailed work on the given plates before effecting cutting. There were no visible lines as guides for effective and neat cuttings. Correct cutting tools could not be used hence the difficulties arising in producing the internal corners. Chain drilling through the internal profile and chiseling was an appropriate action.

It was also observed that many candidates failed to assemble the finished work and those who did either riveted or misalign parts.

TEST B

Candidates were supplied with one piece free cutting mild steel rod, Ø35 mm x 80 mm to produce the machine part indicated on the detailed drawing in test B.

Candidates were required to mount the workpiece in the 3-jaw chuck and face both ends of the workpiece to the required length of 65 mm. After obtaining the length, one end should be centre drilled to facilitate support from that end, on centre.

The workpiece ought to be step turned to diameter 20 mm and length 30 mm then followed with compound-slide taper turning to a length of 15 mm set at an angle of 16.5º to obtain the cone end of the part. A tapping hole of 8.7 mm should be drilled and finally tapped to 10 mm. Change workpiece and hold the diameter 20 mm in the 3-jaw chuck. Candidates were then required to turn to the 30 mm diameter and perform the knurling operation. After diamond knurling, the edge should be chamfered to the 2 x 45º chamfer. Working to precise dimensions was candidates' difficulty.

TECHNICAL DRAWING 2

1. GENERAL COMMENTS

Candidates' performance as compared with those of the previous years was poor though the standard of the paper was good.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) The interpretation of the isometric projection to orthographic projection was perfectly done and all the features were provided.
(2) The pencil work was neat.
(3) Candidates did well and constructed the true lengths for each side of the given laminae and used them to construct the true shape.
(4) The internal tangent to two unequal circles was constructed with accuracy. Candidates used various procedures.
(5) Candidates did well in the construction of the pentagon with the given sides and angles but were unable to construct the enlargement to the ratio 3:1.
(6) Few candidates constructed the plan from the given elevation of the hexagon and did well to construct the true shape of the cut surface. The projectors were neat and accurate.
(7) For the simply supported beam the few candidates who attempted the question did well and provided the force diagram, link or furnicular polygon and shear force diagram.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) The interpretation of isometric projection to orthographic projection was poor. Candidates could not critically view and place each side up the block into its various planes. The hidden lines were wrongly positioned likewise centre lines were neglected.
(2) The use of auxiliary planes to construct true lengths and shapes of laminae were not familiar with the candidates. Candidates did not indicate the auxiliary elevation, plan and the angle of inclination of the true length to the horizontal plane.

(3) The enlargement by side for the given ratio 3:1 was poor. Candidates did not interprete the ratio 3:1. Some reduced the side instead of enlargement but all the procedures used were inaccurate.

(4) Candidates hatched the cut surfaces of the hexagonal prism without leaving the hole unhatched. Others did not show the outlines for the hole at the various views. Some of the projectors were not perpendicular to the cut surfaces.

(5) Simply supported beam. Scale conversion was inaccurate. Some candidates did not label the spaces with Bow's Notation. Drawing of parallel lines to obtain the link polygon from the force diagram was poor.

4. SUGGESTED REMEDIES

(1) Candidates must be encouraged to have constant practices on:
   - (i) orthographic projections into isometric or oblique projections, vice versa, from simple to complex objects.
   - (ii) auxiliary projections, lines and planes in spaces, true lengths and traces of lines and their true shapes of laminae.
   - (iv) conversion of scales.
   - (v) The meaning of ratios, e.g 1:3 or 3: and their interpretations.

(2) Students should be directed to the appropriate pencil to use at various stages of construction, drawing of parallel lines using set squares or straight edge and a pair of compasses.

5. DETAILED COMMENTS

Question 1

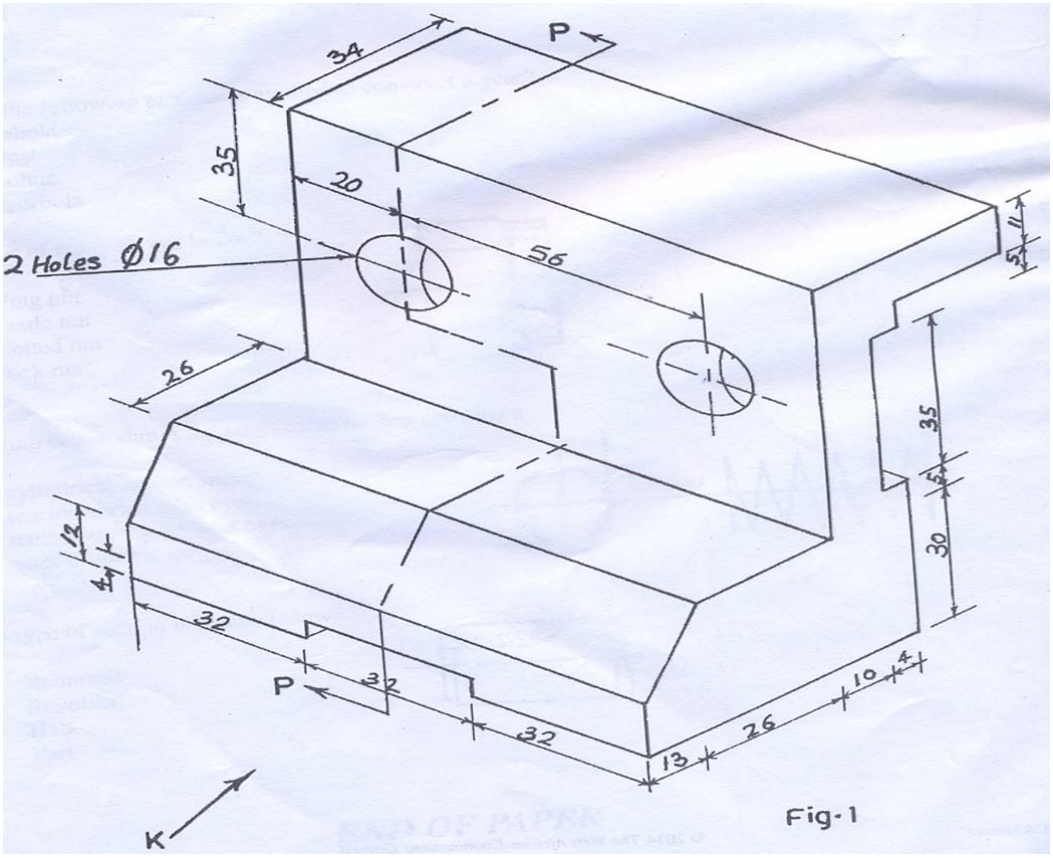


Fig. 1 is an isometric projection of a guide bracket. In first angle orthographic projection, draw the full size of the:

- **(a) front elevation in the direction of arrow K;**
- **(b) plan;**
- **(c) left end elevation;**
- **(d) sectional elevation on pp.**

(Give principal dimension only)

The question demanded four views at the various positions in first angle projection: front elevation, plan, left and right end elevations. Candidates confused on the positioning of the left end view. (In first angle projection, the left end view is placed at the right side of the front elevation). Most candidates did not draw the slot, 32, at the base of the block. Those candidates who produced the slot hatched it as well as the hole. (There are some features on objects that do not required hatching; e.g holes, webs, slots, keys, etc.).

Some candidates isolated the four views by placing them at their own spaces of convenience, i.e, the views were not in conformity to either first or third angles of projections.

Question 2

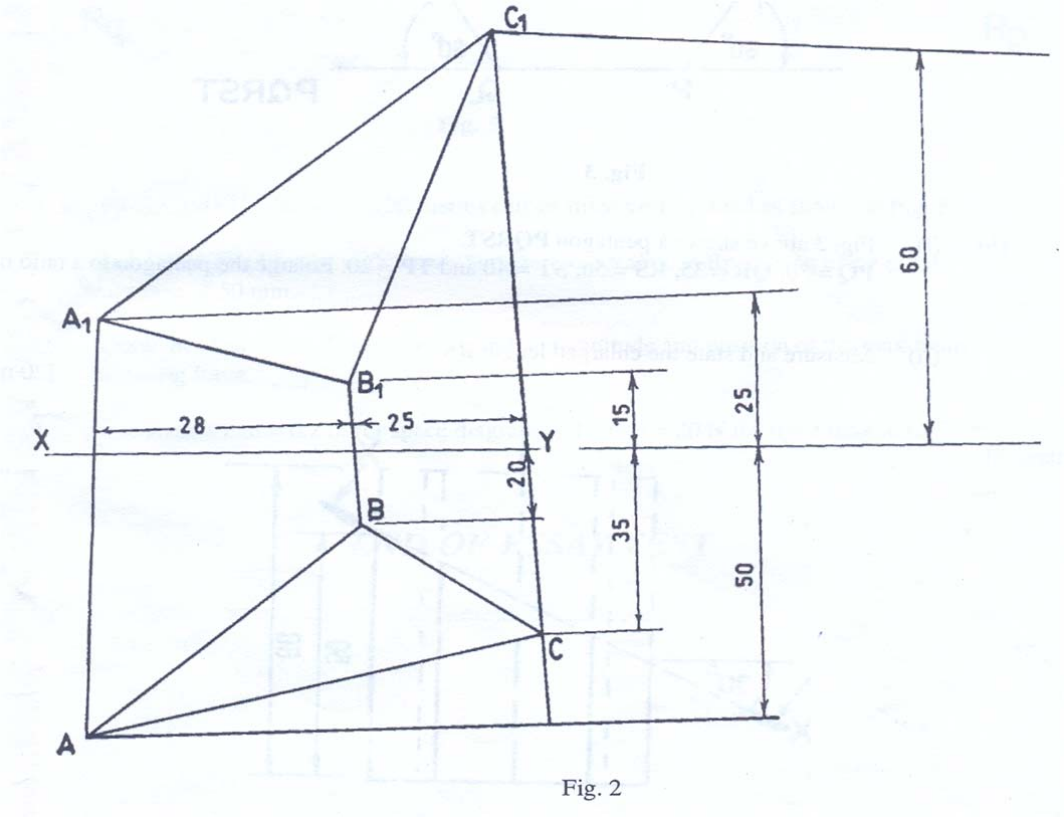


Fig. 2

Fig. 2 shows the elevation and plan of a triangular laminae in first angle projection.

- **(a) Draw the true shape of the laminae.**
- **(b) Measure and the state the**
  - **(i) angle of inclination to the horizontal plane;**
  - **(ii) true length of AC.**
- **(c) Indicate on the drawing the:**
  - **(i) auxiliary elevation;**
  - **(ii) auxiliary plan.**

The front elevation and the plan were correctly produced by most candidates.
Some candidates constructed the true lengths of the three sides of the laminae separately and later used those true lengths to construct the true shape. In this case the principle is acceptable but there were inadequacies in drawing the auxiliary elevation and plan.

The true shape was obtained by first constructing the first auxiliary elevation upon which the angle of inclination to the horizontal plane and the true length of line AC was determined.

The procedure was: first draw a line parallel to one side of the laminae in the plan view. Then draw parallel lines from each corner (on apex) of the laminae in the plan to intercept the drawn line. Further project perpendicular from the points of interception and take dimension on each point from the elevation.

Question 3

(a) (i) Construct an internal tangent to two unequal of diameter 30 and 58 respectively, whose centres are 100 apart.

(ii) Measure and state the distance between the points of tangency.

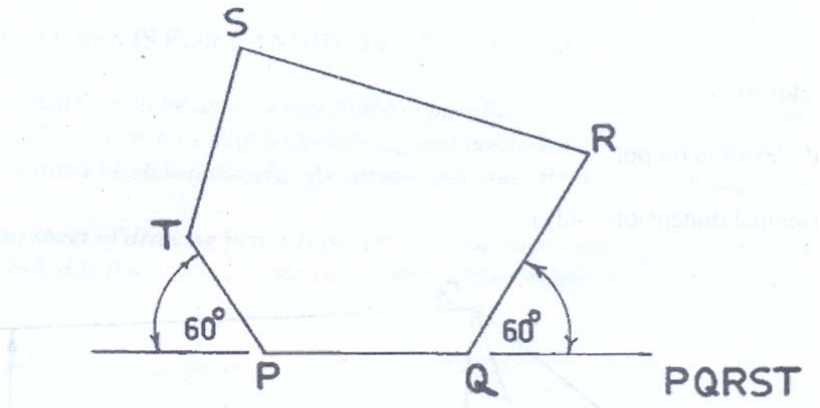


Fig. 3

(b) (i) Fig. 3, above shows a pentagon PQRST.
PQ = 30, QR = 35, RS = 56, ST = 40 and TP = 20. Enlarge the pentagon to a ratio of 3:1.

(ii) Measure and state the enlarged length RS.

This question was well answered by most of the candidates. The internal tangent was neat and accurately drawn.
Only few candidates drew external tangent and some candidates used the diameter as radius.

The construction of the pentagon was well done by most candidates but they were unable to enlarge it. The given ratio 3:1 was not understood by most candidates. The ratio was to enlarge the pentagon three times but some candidates rather reduced it. The method used was inappropriate.

There are various methods for this construction:

- extending one side outside the figure and dividing the extended side into the given ratio;
- locating a pole inside the given figure and joining the pole to one corner of the figure and dividing the line into the given ratio.

Question 4

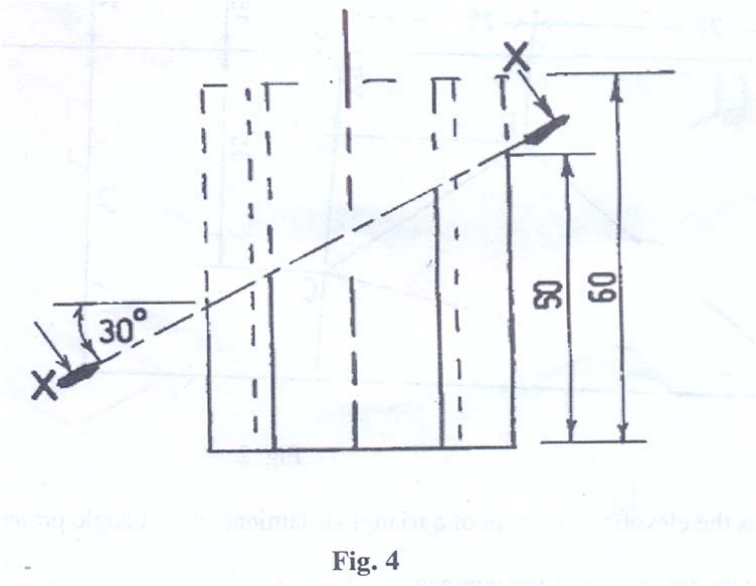


Fig. 4

Fig. 4 shows the front elevation of a hexagonal prism side 25 with a hole diameter 30. Draw full size, the following:

(a) given elevation;
(b) plan;
(c) end elevation;
(d) true shape on plane X-X.

Few candidates did very well in all the three required views. The outlines for the hexagon were clearly visible from the construction lines. The hatched lines for the cut surfaces were neatly done and were evenly spaced and at correct angle of inclination.

The rest of the candidates were unable to draw more than two views, either the given elevation and the plan, or end view or the true shape. But the work was inaccurate. The outline for the internal hole was produced as hidden on the cut surface. Others hatched all the cut surface including the hole.

Some candidates did not show the projection lines and were unable to draw the plan and end views perfectly. The projection lines for the true shape of the cut surface were not perpendicular to the surface. The line for the true shape was omitted, some of the candidates could not transfer the distances from the plan to obtain the correct shape.

Question 5

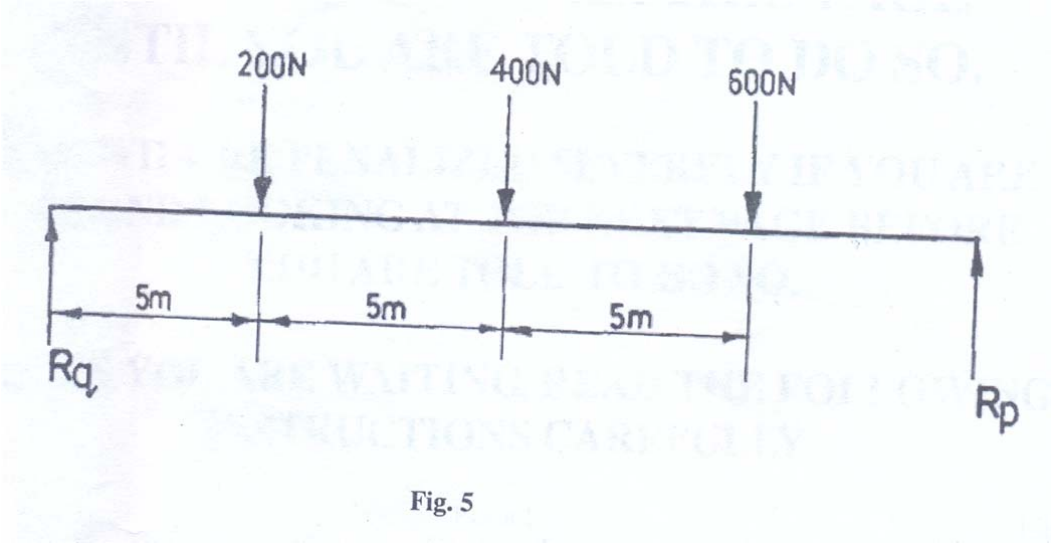


Fig. 5

A simply supported beam of span 20 metres carries three vertical load as shown in Fig. 5.

(a) Determine graphically, with Bow's Notation, the reactions Rp and Rq using polar distance of 50 mm.

(b) Draw the shear force diagram and state the magnitude and position of the maximum shearing force.

Use the scale of 1 mm = 0.2 m for space diagram and 1 mm = 20 N for force diagram.

The scale conversion was poor. Only few candidates converted the beam, length 20 m, to its correct scale of 100 mm (i.e 1 mm = 0.2m). The loads and the reactions were represented correctly with their arrow heads.

Most candidates labelled the spaces with the Bow's Notation, but failed to label the space between the two reactions, Rp and Rq.

The force diagram was averagely done. Few candidates did well and converted the scale of 1 mm = 20 N to obtain the force line, i.e 200 N = 10 mm, 400 N = 20 mm and 600 N = 30 mm, but the selection of polar point was inaccurate. Other candidates selected wrong scale and had enlarged force diagrams and very small force diagrams.

The performance on the shear force diagram was on the average. Some few candidates did not reverse the force diagram but managed and constructed accurate shear force diagram. Few failed to hatch the diagram.

The outlines were not visible, the thickness was similar to the construction lines.
Few candidates constructed the bending moment diagram, which the question never asked for. The general performance of the candidates was good.

TECHNICAL DRAWING 3

1. GENERAL COMMENTS

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

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Majority of the candidates responded to the demands of the questions as demanded by the rubrics.
(2) Majority of the candidates had very good line work.
(3) Candidates produced neat and accurate assembled blocks.
(4) Majority of the candidates used the given scales to inteprete the various parts of the building drawing, i.e sectioning views, plan and front elevation.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Most candidates found the freehand sketching difficult, especially converting from orthographic projection to pictorial drawing.
(2) Majority of candidates could not distinguish between isometric block and oblique block.
(3) The draughtmanship skills of candidates was very poor.
(4) Candidates had poor sectioning skills.

4. SUGGESTED REMEDIES

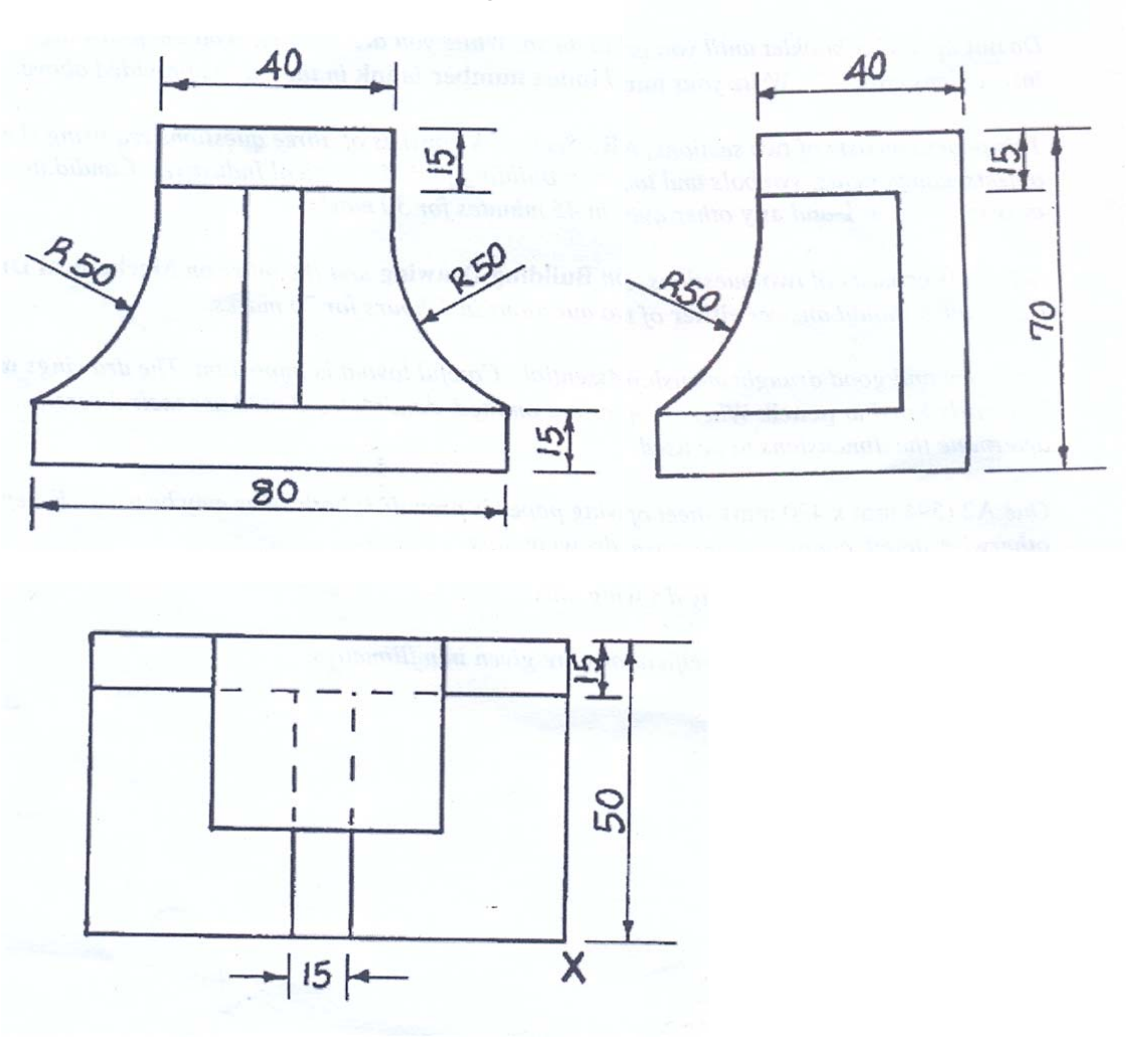
(1) Teachers should give more exercises in freehand sketching to students in order to boost their confidence.
(2) Candidates are also encouraged to practice sectioning of objects.
(3) Teachers should teach using demonstrations and improvised teaching and learning aids to re-enforce students understanding of the subject.

(4) Teachers should make extra teaching hours to complete the syllabus.

5. DETAILED COMMENTS

Question 1

The figure below shows a block in first angle projection.
Make a freehand isometric drawing of the block making X the lowest point.



Majority of the candidates performed poorly in this question. Candidates could not translate the views, i.e. the orthographic into its proper assembled drawing.

Majority of the candidates used instruments to assemble the parts and could not make point X the lowest point.

Question 2

Make a neat freehand sketch of the pictorial view of a spade.

Majority of the candidates could not sketch the spade in a pictorial form but rather drew the spade using two dimensions. Few candidates could also not distinguish between a spade and a shovel. Candidates' performance was good.

Question 3

Make a neat freehand sketch of the pictorial view of a double open ended spanner.

This was a very popular question amongst the candidates. Majority of the candidates drew the double open ended spanner correctly.

Candidates' performance was very good.

Question 4

A floor plan and specifications of bungalow and candidates asked to draw the following:

(a) Draw to a scale of 1:100, the front elevation and right side elevation.

(b) Draw to a scale of 1:50 a detailed section from foundation to roof; inserting eight important dimensions and specifications.

Majority of the candidates could not answer the questions properly. The difficulty area found by majority of the candidates had to do with drawing of the front elevation and the right end view of the plan.
Candidates wasted time by copying the ground floor plan which was not demanded by the rubrics.

The draughtmanship skills placing the views was poorly done by majority of the candidates, the roof structure was poorly interpreted.
Candidates' performance was fair.

Question 5

Two views of a bracket were given in first angle projection. Candidates were required to draw in first angle projection the sectional front elevation on a specified plane, the sectional plan and the end elevation indicating all the hidden details.

Few candidates responded very well to this question. Few candidates wrongly sectioned the parts. Candidates interchanged the view by making it third angle projections instead of first angle projections. Generally, the end elevation was poorly drawn by the candidates. Candidates drew webs and holes correctly. Candidates' performance was good.

WOODWORK 2

1. GENERAL COMMENTS

The standard of the paper was good and compared favourably with that of the previous year. The general performance of candidates was not encouraging as that of the previous year. A few however performed creditably.

2. A SUMMARY OF CANDIDATES' STRENGTHS

A few candidates performed well in the following areas:

(1) Freehand pictorial sketches;
(2) Presentation of Orthographic drawings in the Third Angle projections.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

Most candidates showed weakness in the following areas:
(1) lack of skills to use pencils only for the freehand pictorial sketches;
(2) poor draughtsmanship;
(3) poor use of technical terms and jargons in candidates responses.
(4) inability of candidates to express themselves very well to put their thoughts across.

4. SUGGESTED REMEDIES

(1) Tutors should give candidates adequate exercises to improve upon their skills in sketching.
(2) Candidates should be introduced to and encouraged to use technical terms and jargons.
(3) Candidates should on their own practice the use of pencils only to do freehand sketches.

5. DETAILED COMMENTS

Question 1

(a) State the main reason why synthetic foam is used as a padding material in upholstery.
(b) State two reasons for staining wood.
(c) List four angle joints used in woodwork.

(a) Most candidates were unable to state the required answers correctly. They include:
- to provide soft, smooth contours;
- to provide comfort.

(b) Majority of candidates provided the required answers.

(c) A few candidates were able to list the required joints. Most candidates listed other joints which were not angled. The required joints include: simple butt, dado, plain mitre.

Question 2

(a) State two safety rules to be observed when carrying hand tools in the workshop.
(b) List four cutting operations that are carried out on the band saw.
(c) List two testing tools used in woodwork.

(a) Most candidates provided the required answers. A few however stated general workshop safety measures.

(b) Very few candidates were able to list all the four cutting operations correctly. Majority of candidates listed parts of the band saw. The operations include: crosscutting, curve cutting, ripping, etc.

(c) Majority of candidates were able to list the required tools. A few however listed general tools instead of testing tools.

Question 3

(a) The table below shows four classes of timber defects

Seasoning	Decay	Growth	Insect Attack

Copy the table and use it to classify the following timber defects:

check	**split**
knot	**wet not**
dry not	**borers**
wane	**warp**
case hardening	**sharp**

(b) (i) List the two main classifications of plastics.
(ii) Explain the differences between the two classes of plastics in (b)(i).

(a) Majority of candidates copied the table and classified the defects under their appropriate headings.

(b) Most of the candidates who attempted this question answered the first part very well but could not explain the second part. The required answer for the second part of the question is: Thermosetting plastics cannot be remoulded by heating while thermoplastics can be remoulded by heating.

SECTION B

All dimensions are in millimeters. You should work to the main dimensions but where no dimensions are given, you should use your own discretion.

Marks will be awarded for draughtsmanship.

Answer all the questions.

A primary school writing desk is to be designed to the following specifications:

height at front	**-**	**660**
height at back	**-**	**700**
length	**-**	**600**
width	**-**	**450**

(All dimensions are in millimeters)

The top is 20 mm thick solid wood. It has a 6 x 6 mm groove 20 mm from the back edge to hold pens and pencils. The desk has an open storage space at the front, 100 mm deep beneath the top.

1. **Make two preliminary freehand pictorial sketches each for a different design of the writing desk.**
2. **Select one of the sketches in question 1 and indicate the sketch selected by a tick (√). To a scale of 1:5; draw in the Third Angle Orthographic Projection, the following views of the sketch selected:**
   (i) the front elevation;
   (ii) the end elevation.
3. **Suggest one appropriate method of securing the desk to the frame.**

Question 1 - Preliminary Freehand Sketches

Majority of candidates presented designs that agreed with the required specifications. However, almost all the candidates produced their preliminary sketches with the aid of drawing instruments and later used freehand to trace through. This is not accepted. Candidates must desist from such practice and draw with only pencil.

Question 2

(j) Front Elevation

All the candidates attempted this question following the principles of Orthographic projection.

Most candidates however did not show hidden details, dimensions and naming of the views. In all, candidates demonstrated their knowledge and understanding of presenting views in Third Angle Orthographic projection.

(ii) End Elevation

This view was well projected and presented by most candidates. The sections of the following members were however omitted by most candidates: shelf and back cover. Most candidates also did not indicate the pencil/pen groove.

Question 3

Method of Securing the Desk top to the Frame

Almost all the candidates failed to state the correct method of securing the desk top to the frame. The required methods include: slot screwing and metal/wood buttons.

Draughtsmanship

(k) Border lines

Most candidates failed to draw the border lines. The few who attempted to draw also used wrong measurements for the margins.

(ii) Title Block

Majority of candidates continue to ignore the provision of title block which should give information such as name, index number, title of drawing scale and date.

(iii) Layout

Most candidates did not plan the layout of their work well. It is very important that candidates learn to plan their work properly in order to present neat and readable work.

(iv) Neatness

Majority of candidates used wrong types of pencils for the drawing which made their work dirty when they cleaned. Candidates should note that overshading of preliminary sketches also tend to make their work dirty when it is overdone.

WOODWORK 3

1. GENERAL COMMENTS

The standard of the paper was within the scope of the syllabus and compared favourably with that of the previous year. The performance of candidates was slightly better than that of the previous year.

2. A SUMMARY OF CANDIDATES' STRENGTHS

A few of the candidates were able to:
(1) interpret the drawing correctly;
(2) mark-out correctly;
(3) produce a very good work.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

Majority of the candidates were unable to:
(1) cut-out accurately;
(2) use well sharpened and good conditioned tools;
(3) read and interpret the working drawings correctly;
(4) finish their work.

4. SUGGESTED REMEDIES

(1) Teachers should improve upon the teaching of orthographic and working drawings.

(2) Teachers should give more practical exercises which involve the reading and interpretation of working drawings.
(3) Candidates should be encouraged to sharpen their cutting tools before use.
(4) Candidates on their own should practice the steps involved in realizing an artifact.
(5) Candidates should be able to make time to finish their work.

5. DETAILED COMMENTS

The work involved the following processes:

(1) Through Dovetail joint;
(2) Bareface mortise and tenon joint;
(3) Hanger;
(4) Notches;
(5) Boring screw holes;
(6) Tapering;
(7) Finishing.

(1) Through Dovetail Joints

This was attempted by all the candidates. Most of the candidates were able to mark-out accurately and produced a fairly good joint. A few candidates however lacked the requisite skills and therefore produced a very poor work. Very few candidates produced pin joints instead of the through dovetail joint demanded by the question.

(2) Bareface Mortise and Tenon Joint

Candidates were required to mark-out and cut a well fitting bareface mortise and tenon joint. Most candidates produced the required joint. A few could not produce accurate joint while very few of the candidates constructed through mortise and tenon joints instead of the required bareface mortise and tenon joint.

(3) The Hanger

Candidates were required to bore holes through the two vertical members of the holder and round a piece of wood to fit freely in the holes. Most of the candidates produced a satisfactory work. A few either produced hangers which were too tight in the holes or bigger than the holes and therefore could not fix them. Others could not attempt this part of the question at all.

(4) Notches

The notches were used to strengthen the lower end of the holder. Majority of candidates were able to mark-out and cut the notches. A few however chiseled out the waste rather poorly due to the use of cutting tools with blunt cutting edges.

(5) Boring Screw Holes

A few candidates were able to bore the screw holes. Most candidates used wrong tools to cut out square holes instead of round holes.

(6) Tapering

Candidates were required to mark-out the slopes, saw off waste wood and plane the cut surface to perfection. Most of the candidates were able to mark-out and saw off the waste wood but failed to plane the cut surface as required.

(7) Assembling

Most of the candidates were able to assemble the work, few did partial assembling, a few could not assemble and therefore tied the pieces together for easy identification. Very few however left the workpieces mixed up in the boxes with some partially labeled and in some cases not labeled at all. It is compelling that candidates label all the workpieces and tie up all pieces which could not be assembled.

(8) Finishing

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