RESUME OF THE CHIEF EXAMINERS' REPORTS FOR THE TECHNICAL SUBJECTS

1. STANDARD OF THE QUESTION PAPERS

The Chief Examiners reported that the standard of the papers was comparable to that of previous years and that the questions as much of the syllabuses as possible.

2. PERFORMANCE OF CANDIDATES

The Chief Examiners' assessment of the general performance of candidates was varied. This ranged from good performance to generally poor. They reported good performance in Applied Electricity 1 and slight improvement in Auto mechanics 1and Building Construction 2. They however reported of average performance in Electronics1 and 2, Metalwork 1 and 2, Technical Drawing 2 Woodwork 1 and Building Construction 2.The Chief Examiners further reported that candidates' performance were relatively poor in Applied Electricity 2, Technical Drawing 1, Woodwork 3 Building construction 1and Auto Mechanics 2.

3. A SUMMARY OF CANDIDATES' STRENGTHS

The Chief Examiners identified the following qualities as good points in candidates' script :

(1) ORDERLY PRESENTATION OF ANSWERS

The Chief Examiners were of the view that candidates for Auto Mechanics 2, Building Construction 2 and Metalwork 2 presented their work systematically. It was further indicated that in Technical Drawing 1 and 2 as well as Metalwork 1, majority of candidates obeyed the demands of the rubrics.

(2) APPLICATION OF KNOWLEDGE AND SKILLS

Some candidates of Applied Electricity 2, Electronics 1 and 2 demonstrated good arithmetic skills for solving analytical problems. It was indicated that candidates for Applied Electricity 1 applied good theoretical knowledge to their practical work. Good and illustrative sketches were provided by candidates of Building

Construction 1, Technical Drawing 1 and Building Construction 2.

(3) DEMONSTRATION OF PRACTICAL SKILLS

Candidates were commended for demonstrating good draughtmanship skills in Technical Drawing 2 and appropriate skills required for good connection of circuit in Electronics 1 and Applied Electricity 1. They also observed safety rules and regulations. Their selection of tools in Auto Mechanics 1 and Metalwork 1 was found to be apt.

4. A SUMMARY OF CANDIDATES' WEAKNESSES

The Chief Examiners identified the following weaknesses in candidates' work.

(1) INADEQUATE PREPARATION FOR THE EXAMINATION

From the responses provided by some candidates, the Chief Examiners noted that many candidates did not prepare well for the examination. This was observed in Auto Mechanics 2, Building Construction 2, Technical Drawing 1 and Woodwork 2.

(2) POOR PRACTICAL SKILLS

The lack of skills in handling some tools was reported in Auto Mechanics 1 and Woodwork 3. It was reported that many candidates did not know the use of certain instruments in Electronics 1 or lacked craftsmanship in Metalwork 1. The experimental presentation by most candidates in Applied

Electricity 1was described as poor.

It could be inferred that candidates did not do enough practical exercises to enable them go through the practical examination without difficulty as expected.

(3) POOR TIME MANAGEMENT

Candidates' inability to answer required number of questions also affected their performance. In some cases they wasted time in copying diagrams and gave irrelevant responses to questions as were noted in Applied Electricity 1, Building Construction 1, Electronics 1 and 2.

(4) LIMITED KNOWLEDGE IN SUBJECT MATTER

Candidates showed lack of in-depth knowledge of subject matter in Woodwork 2 and 3, Technical Drawing 2, Electronics 2 and Applied Electricity 2. In the case of Metalwork 2, many candidates had difficulty in answering application questions. Majority of candidates could not interpret orthographic views. Some candidates had difficulty in drawing sketches in Technical Drawing 1 and

Woodwork 1, 2 and 3.

(5) NON ADHERENCE OF RUBRICS

The Chief Examiners reported that candidates for Building Construction 1, Metalwork 2 and Electronics 1 and 2 did not understand the demands of the questions well and this resulted in their providing irrelevant information and deviated from the expected answers.

5. SUGGESTED REMEDIES

The Chief Examiners gave the following suggestions which could help students overcome their weaknesses.

(1) Candidates must complete the syllabuses and get good tuition before they take the examination.

(2) Teachers should teach the techniques of answering questions.

(3) Candidates offering subjects with practical components should be exposed to more practical lessons.

(4) Candidates should practice more on experiments to improve their skills and their laboratories must be equipped with modern user-friendly instruments. There should be more participation in garage activities and they should be properly trained in the use of tools and equipment.

(5) Candidates should develop good reading skills to improve their spelling. They must be helped to improve their reading and communication skills.

(6) They should also read questions well to know the demands before answering them. They should read widely on their subjects.

(7) There should be a conscious effort by teachers to improve the sketching skills of candidates. This could be done by giving more exercises in freehand sketching. Candidates must practise how to use sketches to answer questions.

APPLIED ELECTRICITY 1

1. GENERAL COMMENTS

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

Candidate's performance compared with the previous years was good.

2. SUMMARY OF CANDIDATES' STRENGTHS

(1) Candidates applied their knowledge with respect to Ohm's Law in a d.c circuit.

(2) Candidates plotted good graphs using points of best fit.

(3) Majority of the candidates were able to connect the circuit diagrams successfully.

3. SUMMARY OF CANDIDATES' WEAKNESSES

(1) Candidates' experimental presentation was poor due to lack of practical exercises.

(2) Candidates wasted time by copying the circuit diagrams not demanded by the rubrics.

4. SUGGESTED REMEDIES

(1) Candidates should be encouraged to practice at the laboratory to build their confidence and skills in practical activities.

(2) Candidates should read more literature on Applied Electricity to improve their level of understanding of the subject.

(3) Teachers should ensure that they employ the right apparatus in demonstrating their lessons.

5. DETAILED COMMENTS

Candidates were provided with the following apparatus:

one d.c variable power supply (0 – 15V);

six 1.5V cells;

three 2.5V torchlight bulbs;

one d.c ammeter (0 - 100 mA);

one d.c voltmeter (0 - 10 V);
one 2.4 kΩ ½ W resistor, R,;
one 3.0 kΩ ½ W resistor, R,;
one 3.9 kΩ ½ W resistor, R,;
one breadboard or its equivalent;
one toggle switch S;
a set of handtools;
connecting wires.

Question 1

AIM: Verification of Ohm's law in a d.c circuit.

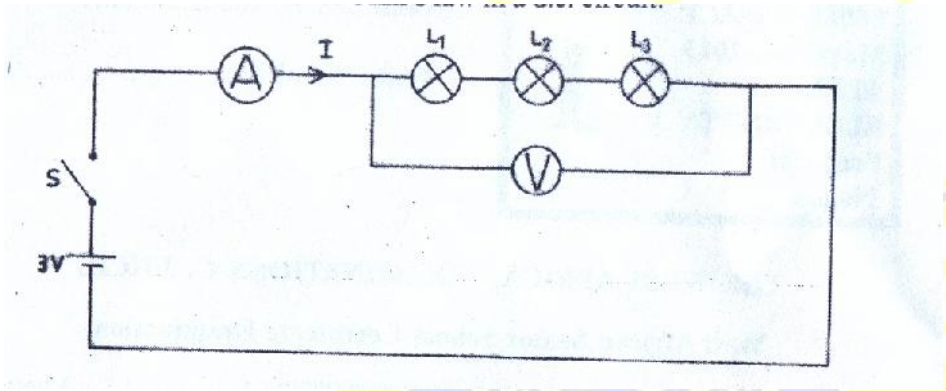


Figure 1

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

Table 1

Number of cells	V(V)	I(mA)	L(Condition of bulbs)
2			
3			
4			
5			
6			

(d) **Close switch S.**
(e) **Read and record the readings on the ammeter, A and voltmeter, V in Table 1.**
(f) **State the condition of the bulbs in column L in Table 1**.
(g) **Open switch S.**
(h) **Increase the number of cells as shown in Table 1.**
(i) **Repeat steps (d) to (g) for each cell increment as shown in Table 1.**
(j) **Plot a graph of voltage V(V) on the vertical axis against current *I*(mA) on the horizontal axis.**
(k) **Determine the slope of the grap**h.
(l) **Evaluate the resistance of bulb L_1**.

Majority of the candidates performed the experiment satisfactorily. Candidates obtained the correct voltages and currents for the stipulated number of cells and stated the conditions of the bulbs.

Candidates who drew the graphs could not indicate the slope of the graph but calculated in detail the resistance of the bulb. (L_1). Candidates' performance was very good.

Question 2

1. **AIM: Determination of the equivalent resistance of a circuit**.

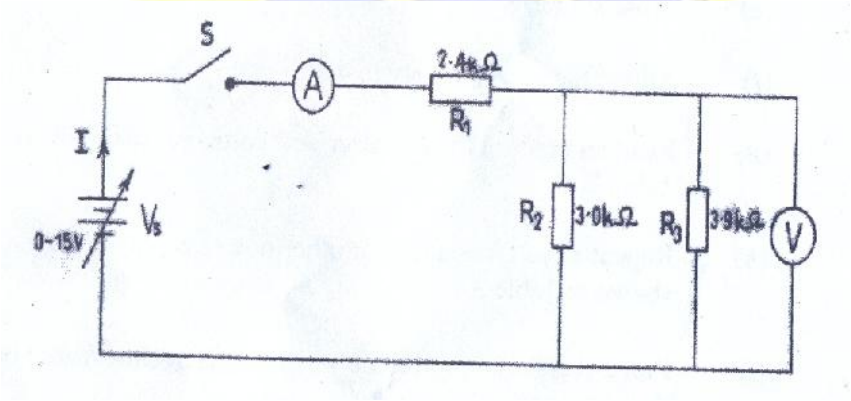


Figure 2

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

Table 2

Power supply voltage Vs(V)	V(V)	*I* (mA)
4		
6		
8		
10		
12		

(d) Set the power supply to 0 V.
(e) Close switch S.
(f) Adjust the power supply to 4 V.
(g) Read and record the ammeter and voltmeter readings in Table 2
(h) Repeat steps (f) and (g) for other power supply voltages shown in Table 2.
(i) Plot a graph of V(V) on the vertical axis against *I*(mA) on the horizontal axis.
(j) Determine the slope of the graph.

(k) Comment on the slope of the graph.

In experiment 2, candidates were to determine the equivalent resistance of a circuit.

Majority of the candidates were able to adjust the power supply in steps of 4V and recorded the corresponding voltages and currents plotted good graphs and commented on the slope of the graphs.

Candidates' performance was good

APPLIED ELECTRICITY 2

1. **GENERAL COMMENTS**

The standard of the paper is comparable to that of the previous years.
The general performance of the candidates compared with those of the previous years was relatively poor.

2. **SUMMARY OF CANDIDATES' STRENGTHS**

(1) Majority of the candidates calculated r.m.s and average values of an alternating quantity.
(2) Candidates were able to solve the problem involving shunt and multiplier (series resistance) of a moving coil instrument.
(3) Candidates solved problems involving electrical power using the formulae (VI) voltage X current in watts.

3. **SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates' weaknesses were noted in the following areas:
(1) Majority of the candidates could not state the difference between P-type and N-type semiconductors.
(2) Candidates could not sketch and label the output characteristics of npn transistor (CE) amplifier.
(3) Candidates could not apply the principles of operation of a d.c. shunt motor and the effect of inserting additional resistance in series with the field windings.

4. **SUGGESTED REMEDIES**

(1) Teachers should employ teaching/ learning aids in demonstrating basic electrical principles.
(2) Teachers should endeavour to complete the syllabus to broaden the knowledge base of their candidates.
(3) Candidates should learn in detail the various units for electrical quantities.
(4) Teachers should lay emphasis on labelling of circuit diagrams.

5. **DETAILED COMMENTS**

QUESTION 1

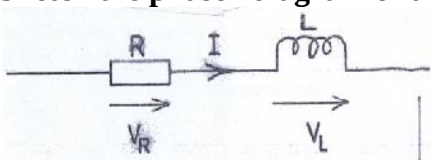
A moving-coil instrument has a coil resistance of 50Ω and gives a full-scale (fsd) for a current of 250 mA.

(a) Sketch the circuit diagram.
(b) Calculate the:
(i) shunt resistance required for the meter to read an fsd of 5 A;
(ii) resistance required for the meter to read 25V.

A popular question and fairly well responded to by majority of the candidates.
Few candidates were unable to calculate the shunt and multiplier resistances, moreover, candidates did not sketch the diagrams as a guide. Candidates in calculating the full scale deflection (fsd) did not subtract the current of 250 mA from the given 5A to give a difference of 4.75A. Candidates' performance was fair

QUESTION 2

(a) Sketch the phasor diagram of the RL circuit shown in Fig. 7.



(b) A current flowing through a circuit is represented by the expression i = 10 sin 628t Amperes.
Calculate the:
(i) r.m.s. value.
(ii) average value.

Majority of the candidates calculated the r.m.s. and average values, since they easily apply formulae: $\frac{I_{max}}{V_2}$ and $\frac{2I_{max}}{®}$.
Candidates also knew the principles that in series RL circuit the current is common and it is drawn to be in phase with the voltage across the resistor, and that the voltage across it leads the current by an angle of 90°. The general performance of the candidates was fair.

QUESTION 3

(a) Describe briefly with the aid of a diagram, the principle of operation of a shunt-wound d.c. motor.

(b) State the effect of increasing the value of the resistance in series with the field winding.

This was a poorly attempted question by majority of the candidates especially the principles of operation of the shunt wound d.c. motor. Few candidates drew the diagrams without labels and direction of the flow of currents. Since it is a motor, the supply voltage (d.c.) must be clearly indicated. The principle of operation depends on a current carrying conductor placed in a magnetic field, i.e. when the field winding is self-excited and the armature conductors are supplied from the d.c. source, the field and the armature fluxes are produced respectively. The fluxes produced interact to produce a force which causes a motion of the armature. Candidates' performance was generally fair.

QUESTION 4

(a) Explain the layout diagram with respect to electrical wiring systems.

(b) A layout diagram has a scale of 1:100. If the length of the cable on the diagram is 65 mm, calculate the actual length of the cable.

(c) A ring main circuit has a 32 A fuse 240 V supply.

Calculate the maximum power available at any time.

Another poorly attempted question by majority of the candidates. A layout diagram is one that details the positioning of accessories in electrical wiring. Candidates' performance was poor.

QUESTION 5

(a) State:

(i) Kirchoff's Current Law

(ii) Kirchoff's Voltage Law

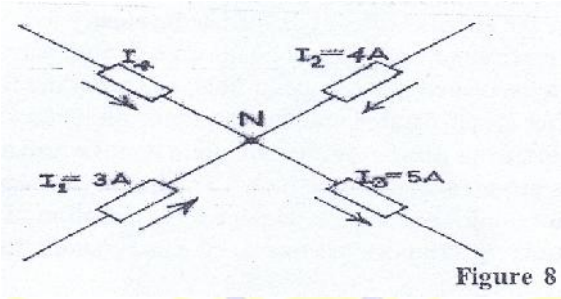


Figure 8

(b) (i) In Fig. 8, calculate the current I_4;

(ii) Comment on the direction of current flow in (b)(i).

A fairly well attempted question by almost all the candidates. Candidates stated perfectly Kirchoff's Current Law and Voltage Law.

Majority of the candidates were able to calculate current I_4 i.e. (-2A) which implies that the assumed direction of current I_4 was incorrect and that it should flow from the point N. Candidates' performance was very good.

QUESTION 6

(a) State two differences between p-type and n-type semiconductors.

(b) State one reason why common emitter (CE) configuration is widely used in amplifier circuit.

(c) Sketch and label the output characteristics of an npn transistor in CE amplifier.

Majority of the candidates who attempted this question did not have an insight into the electronics aspect of the syllabus.

The main difference between a P-type and an N-type are as follows:

P-type semiconductors are doped with a trivalent impurity atom whiles N-type semiconductors are doped with a pentavalent impurity atom.

The reason why common emitter configuration is more preferred in amplifier circuits is that it has a high current and voltage gain.

Majority of the candidates could not sketch the output characteristics curve of an npn transistor in common emitter (CE) amplifier mode. Candidates' performance was poor.

AUTO MECHANICS 1

1. **GENERAL COMMENTS**

The paper as compared to the previous ones was standard. Majority of the candidates performed creditably in the first question as candidates' performance has slightly improved over the previous year.

2. **SUMMARY OF CANDIDATES' STRENGTHS**

As the practical examination was conducted, the following strengths were exhibited by the candidates:

(1) The procedure for carrying out the task was followed.
(2) Candidates wore the appropriate safety clothing.
(3) Tools were selected for the task without much difficulty.
(4) Approach to the task was done with confidence.

3. **SUMMARY OF CANDIDATES' WEAKNESSES**

The following weaknesses were identified:

(1) Candidates attempted holding the cylinder head in a vice.
(2) Safe use and handling of tools was a challenge to the minority of candidates.
(3) Attaching the lapping stick to the valve before lapping was a challenge and took some time for most of the candidates to do it.
(4) Examination of conditions of the valve face and seat were difficult tasks to some candidates.

4. **SUGGESTED REMEDIES**

(1) Candidates should attach seriousness to the study of the subject by reading textbooks and be interested in more practical approach.
(2) (a) Teachers or Instructors should handle students more in the manipulative skills and extract sketches from textbooks and manuals from various vehicle parts for students identification.
(b) Students should be made to locate and identify vehicle component parts.
(3) (a) Candidates need more exposure to automobile workshops during their practicals and individual attachments during vacations.
(b) Students should be encouraged to be interested in practical training activities.
(4) Students should be exposed to the handling and use of tools and equipment in the shop.
(5) Subject masters should teach students the purpose, construction, operation and repair, of vehicle component parts as well as causes of poor operation and remedy of faults.

5. **DETAILED COMMENTS**

QUESTION 1

From the cylinder head provided:

(a) remove one valve specified by the Examiner. Report to the Examiner;

(b) examine the condition of the
(i) valve face;
(ii) valve seat.
Report to the Examiner;
(c) lap the valve. Report to the Examiner;
(d) reassemble the valve. Report to the Examiner;
(e) answer two relevant oral questions from the Examiner.

(a) The removal of one valve was perfectly done by most candidates except a few who had problem in the usage of the valve spring compressor tool.

(b) 99% of the candidates did not know that the seat of the valve is in the cylinder head so they failed to give correct answers to the question. Both the face of the valve and seat could suffer from pitting, burning, wear, pocketing and distortion. The candidates however, could not identify any of those conditions.

(c) While few candidates failed to apply paste to the face of the valve before lapping, others took a position which did not allow them to have a good grip of the tool thus ending poorly. During practical training teachers should guide students to identify the component parts of the distributor, guide them in its dismantling and note all the faulty parts.
The first thing to do in lapping a valve is to apply the paste onto the face of the valve. Next, place the valve on its seal, then attach the lapping stick to it. The next thing to do is to take a position which will enable one to exert a force on the valve during the lapping so as to give it a good seating. Any false position will waste time and the finishing will not be good.

(d) Most candidates reassembled the valve without much difficulty.

(e) Majority of candidates could not give the functions of the inlet and exhaust valve. Most candidates could not identify the components of the valve assembly including cotters, valve spring valve collar and valve stem.

(f) Selection of tools and safety rules were observed and done satisfactorily. A few candidates used the wrong tools for some jobs.

QUESTION 2

From the engine provided:
(a) remove the distributor cover and high tension leads. Report to the Examiner;
(b) remove the contact breaker. Report to the Examiner;
(c) check the condition of the contact breaker points. Report to the Examiner;
(d) refit the contact breaker and set to a gap specified by the Examiner. Report to the Examiner;
(e) remove one spark plug indicated by the Examiner. Report to the Examiner;

(f) check the condition of the plug. Report to the Examiner;
(g) refit the spark plug. Report to the Examiner;
(h) refit the distributor cover and connect the high tension leads in the correct order. Report to the Examiner;
(i) answer two relevant oral questions from the Examiner.

(a) With regards to this question, candidates removed distributor cover without taking note of any marks to ensure correct re-assembly. The high tension leads were also removed without noting their respective spark plugs.

(b) This task was performed on an old type distributor with contact breaker. Removal was easy, so also was fixing back. The problem was setting the contact gap. Some candidates saw the feeler gauge for the first time and identifying the sizes was a problem to them.

(c) Candidates did not know what faults to check for. They were unfamiliar with common contact breaker point problems.

(d) Candidates were able to refit the breaker but were unable to set the gap correctly as specified by the examiner.

(e) Candidates were able to select the correct tool and removed the plug indicated. Most candidates were however, unable to name any part of the spark plug.

(f) Candidates were unable to tell what they were to look for when they were checking the condition of the plug.

(g) Candidates selected the correct tool and refitted the spark plug to its position.

(h) Candidates were able to refit the distributor cover but had some problem or difficulties in connecting the high tension leads correctly. This was due to the fact that most of them did not know the firing orders for a four-cylinder engine and did not note the order in which they removed the leads.

(i) Candidates had little or no idea on simple questions like:
(a) Name three parts of a spark plug.
(b) Name three components of the coil-ignition system.
(c) State two duties of a condenser.
(d) State the purpose of the rotor.
(e) Name two types of a spark plug.

AUTO MECHANICS 2

1. GENERAL COMMENTS

The paper was a standard one but candidates' performance at the examination had declined considerably.

2. SUMMARY OF CANDIDATES' STRENGTHS

Strengths that need to be encouraged are as follows:

(1) Identification of parts or components of units presented in diagrams provided was to some extent good enough.

(2) A few sub-questions were also well answered; notable among them were the following:

Question 3(d) requiring candidates to state the functions of the parts labelled K and N.

Question 4(b) asking candidates to define (i) bleeding (ii) brake servo (iii) brake fade

Question 5(b) was also well tackled by candidates, i.e stating four tests that a vehicle must pass before being issued with a certificate of road worthiness and also

Question 5(c) asking the candidates to name one safety device used by a motorcyclist.

3. SUMMARY OF CANDIDATES' WEAKNESSES

Weaknesses identified were:

(1) Lack of knowledge

(2) Poor drawing of sketches.

(3) Inarticulate explanations of principles and processes.

4. SUGGESTED REMEDIES

(1) Acquiring relevant textbooks to supplement notes received from instructors/teachers.

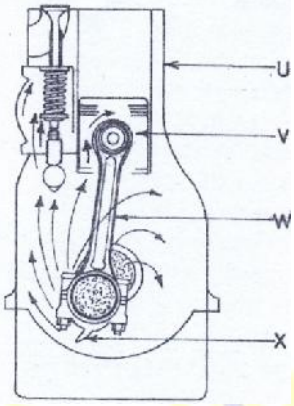
(2) Regular practising of sketches.

(3) Having an exposure in recognised automobile shops.

5 **DETAILED COMMENTS**

QUESTION 1

The sketch below shows a type of lubrication system.



(a) (i) Identify the type of lubrication system.
(ii) Name the parts labelled U, V, W and X.
(iii) Name the component used for checking the level of oil in the sump.
(b) State two demerits of the type of lubrication system identified in (a)(i).
(c) Explain the principle of operation of the lubrication system shown.

In answering this question, answers given by candidates were quite satisfactory but had problems with the following:
(a) Naming the labelled parts U and X.
(c) Describing the operation of splash lubricating system.

From the sketch provided, U is cylinder block not cylinder wall or cylinder as some of the candidates did identify. X is oil dipper and not scooper.
In describing the operation of the splash system a good number of candidates were rather describing the dry sump lubrication.
The operation of the splash lubricating system is as follows:
As the crankshaft revolves, the dipper attached to the connecting rod big end cap scoops lubricate from the sump and splashes onto the upper parts of the engine such as the cylinder walls. The oil on the wall is scraped back into the sump by the oil control ring.

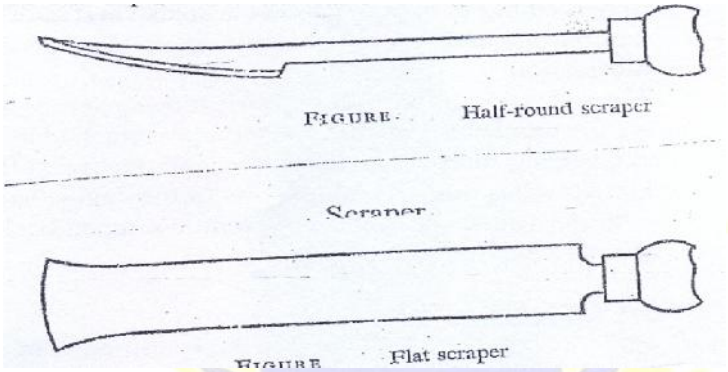
QUESTION 2

(a) Name the tool used to carry out each of the following:
(i) removal of radiator hoses;
(ii) removal of carbon deposit from the combustion chamber;
(iii) checking the gap of the contact breaker;
(iv) removal of drain tap from the sump.
(b) Sketch the tool for removing carbon deposit from the combustion chamber.

(c) List two other parts of a vehicle where each tool named in (a) could be used.

The (a) part of this question was well answered by a number of candidates but the (b) and (c) sections were poorly done.

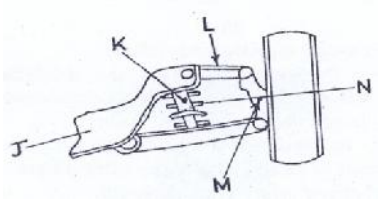
Candidates were supposed to sketch a scraper. Diagrams and sketches produced looked more like a painter's brusch rather than scraper. What was expected of candidates is shown below.



Tool	Where it can be used
(i) Screwdriver	Tappet adjustment, Carburettor adjustment, Water/fuel hoses, fuel pump cover
(ii) Scraper	Valve cover gasket Fuel pump gasket Cylinder bore Exhaust manifold gasket Cylinder head gasket
(iii) Feeler gauge	Cylinder head gasket Valve clearance Spark plug gap Piston ring gap
(iv) Spanner/flat/ ring	Transmission gearbox Rear axle, Steering gearbox

QUESTION 3

(a) Identify the system illustrated in the sketch below



(b) Identify the part labelled J, K, L, M and N.
(c) Explain the purpose of the system identified in (a).
(d) State the function of the parts labelled K and N.

(a) A lot of the candidates said it was 'suspension system' when actually the question centred on the type which is Independent Front Suspension System.

(b) This aspect was also well answered by those who attempted with the exception of 'M'. A good number of candidates thought it was Kingpin/Swivelpin. The correct answer is stub axle.

(c) Candidates were to give the purpose of the independent suspension and here again many were giving the purpose of the suspension generally, while others who were correct said; The purpose of the independent suspension system is to ensure that the deflection of one wheel in the case of a bump does not affect the other wheel, thereby giving the occupants a smooth and comfortable ride.

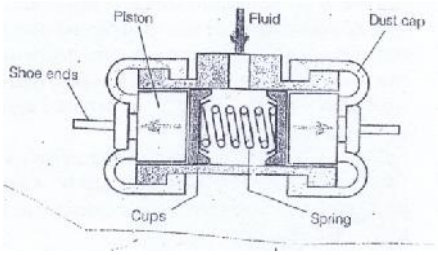
(d) This part of the question required that candidates give the function of the parts labelled K and N. Again, poor expressions and meaningless descriptions were read by the examiner.

The correct answer expected are as follows:
K - Damper: The function of the device is to absorb the energy stored in the spring thereby reducing the number of oscillations when a wheel hits a bump.
N - Spring: The function is to control the up and down movement of the chassis frame in order to reduce roadshocks to the frame and occupants.

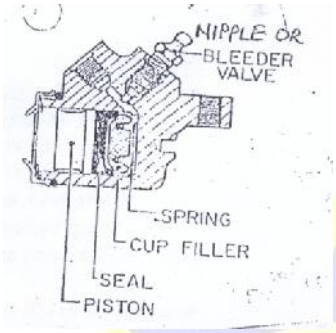
QUESTION 4

(a) (i) Sketch a hydraulic wheel cylinder.
(ii) Label four parts
(b) Define
(i) bleeding as applied to the braking system;
(ii) brake servo;
(iii) brake fade.

(a) Majority of candidates could not produce any meaningful sketch even though what was required was a simple one. An example of what is required is shown below:



OR



(b) Definitions given by some candidates were good yet many were inarticulate with their expressions making their answers vague.

(i) Bleeding is the process of expelling or extracting air from the braking system to ensure effective operation.

(ii) Brake servo is a unit/device in the braking system that helps to boost the drivers effort when the foot brake is applied thus reducing drivers fatigue.

(iii) Brake Fade is the loss of braking efficiency due to overheating as a result of prolonged application of brakes.

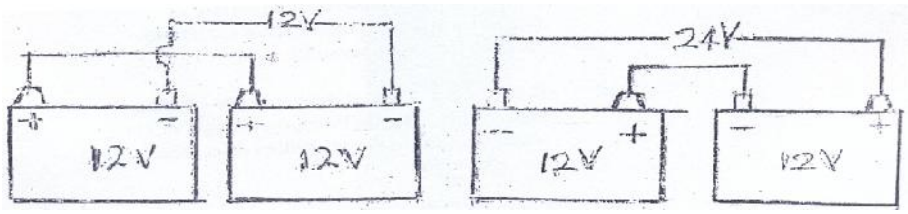
QUESTION 5

(a) With the aid of a simple sketch, show how two 12 volts batteries can be connected to obtain
- **(i) 12 volts.**
- **(ii) 24 volts.**

(b) State four tests that a vehicle must pass before being issued with a certificate or road worthiness.

(c) Name one safety device used by a motorcylist.

Some of them did well whilst others did not. Those who used the cell representations drew only a single cell to represent a 12 volt battery. Others also showed two (2) negatives or positives polaraties for one battery. An example of what the examiner requires is shown below:



BUILDING CONSTRUCTION 1

1. **GENERAL COMMENTS**

The paper compared favourably to that of the previous years. Candidates' performance however seem to have fallen compared to that of the previous years.

2. **SUMMARY OF CANDIDATES' STRENGTHS**

(1) Majority of candidates numbered their responses very well, making good use of the pages of the answer booklets.
(2) Candidates read and followed the rubrics very well.
They therefore answered the required number of questions demanded.

3. **SUMMARY OF CANDIDATES' WEAKNESSES**

(1) Candidates sketching were very poor.
(2) Most candidates could not construct good sentences to explain their responses.
(3) Most candidates lacked in-depth knowledge in the subject.

4. **SUGGESTED REMEDIES**

(1) Tutors should encourage students to practice more sketches.
(2) Tutors should stimulate student's interests in the subject and step up instructions with improved methods of teaching.
(3) Students should take their English Language classes seriously.

5. **DETAILED COMMENTS**
QUESTION 1

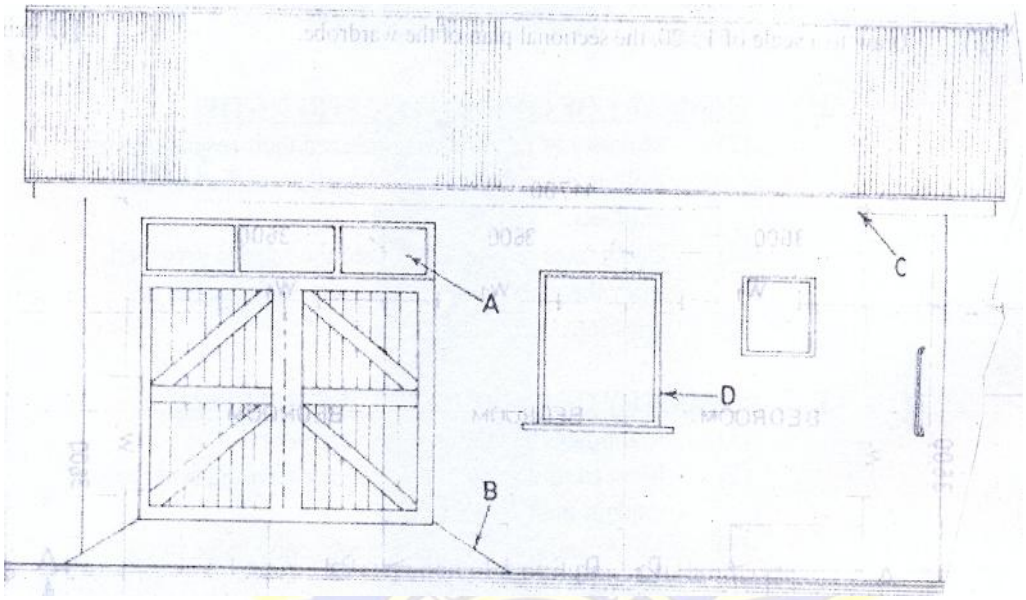


Fig. 1 shows an elevation of a building with landcrete blocks on a made-up ground. Use it to answer the following questions:

(a) (i) **Identify the elements labelled A,B and C.**

(ii) **State one function of each of the elements labelled in (a)(i).**

(b) (i) **A raft foundation is proposed for the building. Produce a sectional sketch to illustrate the foundation.**

(ii) **State two precautions for protecting the foundation in (b)(i) against soil erosion.**

(c) (i) **Sketch a vertical section through the window labelled D to show how water is prevented from getting to the external surface of the wall below it.**

(ii) **Label any four parts.**

(d) **Sketch a sectional plan of the matchboarded doors and label the following parts:**

(i) **meeting stiles;**

(ii) **matchboarding.**

(e) **The roof has a pitch of 30° and is covered with wood shingles. Sketch a constructional detail at the ridge to illustrate how rainwater is prevented from entering the building and label the following parts:**

(i) **bituminous felt sarking;**

(ii) **ridge board;**

(iii) **ridge cap;**

(iv) **wood shingles**

(a)(i) The identification of the element was poorly answered. A few of the candidates identified element 'B' as door frame instead of ramp.

(a)(ii) Majority of candidates lacked explicit knowledge of the functions of the element in question. Many indicated that the function of the fanlight was to allow in ventilation instead of borrowed light into the room.

(b)(i) Majority of candidates sketched the ordinary strip foundation in place of the required raft. The few who sketched the raft could not indicate the reinforcement details.

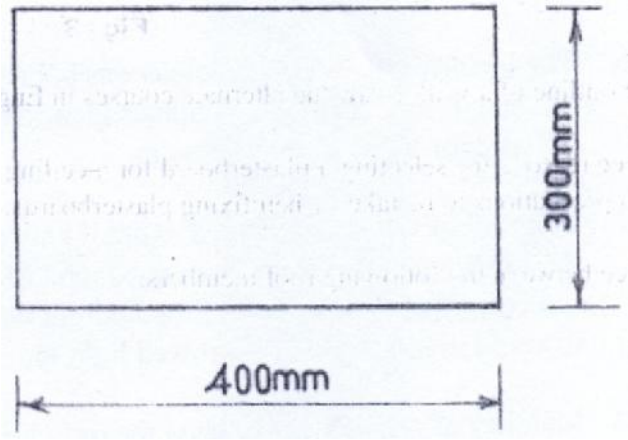
(b)(ii) Most candidates seemed not to have understood the demands of the question so they deviated.
Precaution for protecting the foundation includes:
- providing perimeter drain around the foundation.
- making provision for service lines and ducts before casting the concrete for the raft foundation.

(c)(i&ii)The sketches and labellings provided by most of the candidates were fairly good.

(d) Very poor sketches produced by majority of candidates. Most of them sketched the elevation of the door instead of sectional plan.

(e) Majority of candidates gave encouraging answers.

QUESTION 2



(a) Fig. 2 shows a plan of concrete column for a billboard. The pad foundation for the column is 1500 x 100 x 300 mm thick. Sketch the plan of the profile boarding for setting out the structure.
(b) State three methods of curing concrete in a solid ground floor slab.
(c) Explain the difference between a building line and builder's line.
(d) State three factors that influence the choice of a foundation type.

(a) Majority of the candidates attempted the question but most could not answer beyond sketching of the pegs and profile boards. Markings for the positions of the pad and column base were not done successfully. However, candidates seemed to have understood the question well.

(b) Majority of candidates answered this question did not use the technical jargons. Expected answers include:
- throwing sand on the concrete.
- covering the concrete with rubber and leaves.

(c) Majority of candidates who attempted this question could not answer it appropriately.
A building line is a frontage line or a base line from which all other measurements are taken while a builder's line is used for setting out and walling operations.

(d) Candidates provided very good answers to this question.

QUESTION 3

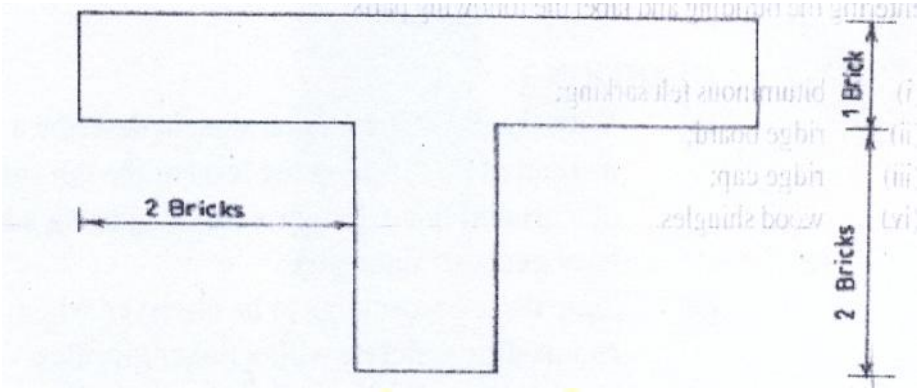
(a) With the aid of a sectional sketch, describe a method of establishing the level at the top surface of a ground floor slab for a building using a spirit level and a straight edge.
(b) State three precautions to be observed when compacting concrete with a poker vibrator.
(c) Explain three methods of preventing decay of timber elements in a suspended timber floor construction.

(a) Majority of candidates lacked in-depth constructional knowledge so almost all the sketches provided had a spirit level laid on a straight edge and both placed on a concrete floor slab.

(b) Most candidates could not give accurate response on the use of the poker vibrator. They include:
- place the poker vertically into the concrete and allow it to run.
- move the poker frequently and insert at close intervals from the preceding position.

(c) Majority of candidates gave fairly good answers.

QUESTION 4



(a) Fig. 3 shows an outline of a wall. Draw the alternate courses in English bond.

(b) (i) State three reasons for selecting a plaster board for a ceiling work.

(ii) State two precautions to be taken when fixing plasterboard.

(c) State the difference between the following roof members:

(i) king post;

(ii) queen post.

(a) Most candidates could not produce very good sketches to answer the question.

(b) (i) Candidates produced fairly good answers.

(ii) Candidates confused precautions with factors.

The precautions to be taken when fixing plasterboards include:

- Avoid or reduce the risk of corrosion, use galvanised fixing.
- The background to receive the plasterboards must be clean, dry and firm.

(c) Majority of candidates provided very good responses.

QUESTION 5

(a) (i) State three safety precautions to be observed when excavating a trench for a deep strip foundation.

(ii) State two advantages in the use of a deep strip foundation over the ordinary strip foundation.

(b) Sketch a longitudinal section to illustrate an open boarded timbering system for a trench excavation in a moderately firm soil and label four parts.

(c) State the main use of each of the following:

(i) gauge box;

(ii) headpan.

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

(b) Most candidates sketched the cross-section instead of the longitudinal section of an open boarded timbering system for a trench. The question demanded for longitudinal section.

(c) Most candidates could not mention the appropriate use of the gauge box. The correct answer is; it is used to batch aggregate.

QUESTION 6

(a) State six stages involved in constructing formwork for in-situ concrete lintel for a door opening.
(b) State the main reason for providing a render to the external surface of a sandcrete blockwall.
(c) State six stages involved in applying a two-coat cement-sand render to the external surfaces of a sandcrete blockwall with ready-mixed mortar.

(a) Most candidates responded by preparing concrete on a platform and casting into the formwork instead of constructing a formwork.
The stages include:
- place the sole plate on a level base.
- place the props in position on folding wedges over the sole plate.
- place head trees on props and stabilise them using struts.

(b) Candidates answered this question well.

(c) Majority of the candidates who attempted this question failed to outline the stages involved. The stages include:
- Prepare the surface to provide key.
- Wet the prepared surface.
- Apply mortar daubs at determined interval to obtain even thickness of the render.
- Apply the first coat and spread between the daubs.

BUILDING CONSTRUCTION 2

1. **GENERAL COMMENTS**

The paper compared favourably to that of the previous years. The questions were well defined and tested candidates abilities in the knowledge and the application domains. The performance of candidates was average.

2. **SUMMARY OF CANDIDATES' STRENGTHS**

(1) Most candidates answered each question on a fresh page.
(2) Handwritings of candidates were clear enough to read.
(3) Labelling of sketches were correctly done by majority of candidates.

3. **SUMMARY OF CANDIDATES' WEAKNESSES**

(1) Candidates showed shallow knowledge in the subject.
(2) Sketches were muddled up creating confusion of ideas.
(3) Words and names of items were wrongly spelt.
(4) Most questions with practical orientation were poorly answered.

4. **SUGGESTED REMEDIES**

(1) Students must improve their reading and spelling skills.
(2) Tutors and candidates should put in the efforts to complete the teaching syllabus.
(3) Tutors should engage candidates on regular practice of sketching.
(4) Candidates should visit project sites regularly to familiarise themselves with the basic operations.

5. **DETAILED COMMENTS**

QUESTION 1

(a) (i) What is meant by the term curing in relation to concrete production?
(ii) Describe two methods of curing concrete.
(b) Explain each of the following terms in relation to setting-out:
(i) bench mark;
(ii) datum level.
(c) Sketch a cross-section through a raft foundation and label the following parts:
(i) external wall;
(ii) ground beam;
(iii) reinforcement.

(a)(i) A few of the candidates talked about methods of curing instead of the meaning of curing. Curing is a method of preventing rapid drying of moisture in concrete.

(ii) Candidates listed methods of curing but did not describe them as the question demanded.

(b) Most of the candidates could not explain bench mark and datum line properly. Bench mark is an established level where all other levels are determined. Datum level is the reference level where all other levels are determined.

(c) A few candidates sketched the raft foundation but could not label the parts. Others sketched the strip foundation instead of raft.

QUESTION 2

(a) List four materials used as roof covering.

(b) Sketch a double pitched roof and label the following:

- **(i) ridge cap;**
- **(ii) purlin;**
- **(iii) fascia board;**
- **(iv) wall plate.**

(c) Sketch a two bay aluminium glazed sliding window and label the following:

- **(i) mullion;**
- **(ii) sash;**
- **(iii) frame.**

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

(b) Most of the candidates sketched double pitched roof but could not label it well.

(c) Some few good sketches were produced, however the sash housing the glass was not shown in some cases. The symbol of glass was a problem to many candidates.

QUESTION 3

(a) List three types of bond used in wall construction.

(b) Explain the difference between in-situ concrete and precast concrete.

(c) List four methods of transporting fresh concrete to the first floor of a building.

(d) Sketch each of the following bricklayers' tools:

- **(i) hand trowel;**
- **(ii) spirit level.**

(a)&(b) Most candidates produced good answers.

(c) This question was very popular among most of the candidates. They provided good responses to this question.

(d) Majority of candidates produced good sketches to answer the question.

QUESTION 4

(a) State two factors that influence the choice of a roof.

(b) Fig. 1 shows a section through a reinforced concrete slab and supporting beams. Use it to answer the following questions:

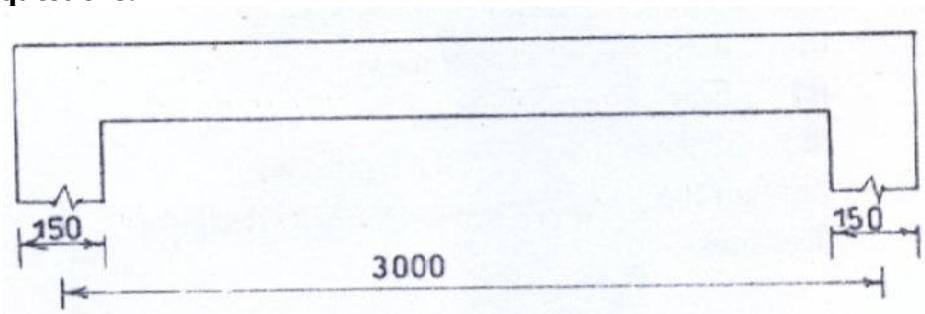


Fig · 1

(i) Reproduce the sketch and show details of steel reinforcements in the slab and beams.

(ii) Label any four parts.

(a) Good responses were given by majority of candidates.

(b) Some of the sketches produced were turned up side down with the beam pointing upwards and sitting on top of the slab. The main bars and the stirrups in the beam were inadequately placed. A few however answered the question well.

QUESTION 5

(a) Sketch each of the following traps used in plumbing works:

(i) P-trap;

(ii) S-trap.

(b) State the function of each of the following:

(i) baffle wall in a septic tank;

(ii) benching in a manhole;

(iii) soakaway chamber in a septic tank.

(c) List four factors to be considered when selecting a floor finish.

(a) A few candidates attempted this question. However, the art of having a vertical part and a curved bottom of the trap to form a letter 'U' was not properly done by candidates.

(b) Most candidates stated the function of soakaway chamber in a septic tank well. They however could not state the function of baffle wall and benching in a manhole. Baffle wall in a septic tank prevents the flow of the effluent directly from the inlet pipe to the outlet pipe.
Soakaway chamber in a septic tank is to dispose off the effluent from the septic tank into the soil.

ELECTRONICS 1

1. **GENERAL COMMENTS**

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

2. **SUMMARY OF CANDIDATES' STRENGTHS**

(1) Majority of the candidates understood the circuit diagrams and successfully performed the two experiments.
(2) Values obtained by most of the candidates were accurate making them draw good graphs.

3. **SUMMARY OF CANDIDATES' WEAKNESSES**

(1) Candidates wasted time by providing irrelevant information not demanded in the rubrics.
(2) Candidates did not know the difference between saturation point and active region of bipolar transistor.
(3) Candidates lacked knowledge in calibrating ammeter readings.

4. **SUGGESTED REMEDIES**

(1) Candidates should practice the skill and techniques in circuit connection especially using variable resistors.
(2) Teachers should teach candidates how to select correct scales for drawing graphs from experimental results.
(3) Candidates should be exposed to more laboratory work to build their capacity and skill in practical activities.

5. **DETAILED COMMENTS**

You are provided with the following apparatus:
one (0-6V) power supply unit;
one (0-12V) power supply unit;
one (0-1000«A) ammeter;
one (0-50 mA) ammerter;
one (0-10V) voltmeter;
one 10 k t potentiometer;
one BC 108 transistor or its equivalent;
two 1 k t , ¼ w resistor;
two toggle switches (Sw_1, Sw_2)
one soldering iron with resin-cored solder;
veroboard/quick test boards;
connecting wires;
long-nose plier;
side cutter.

QUESTION 1

AIM: To determine the d.c. gain of a bipolar transistor.

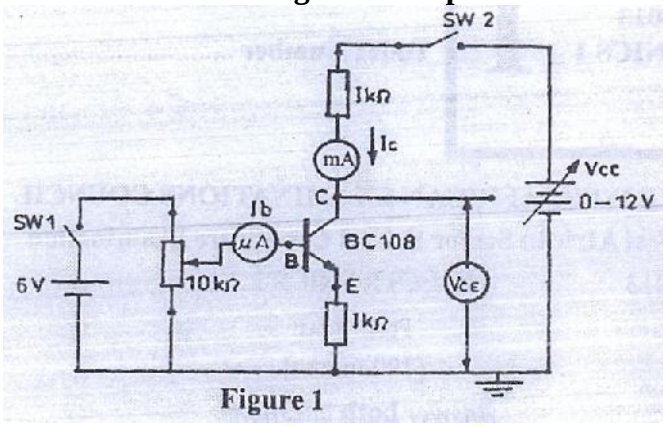


Figure 1

(a) **Connect the circuit diagram as shown in Figure 1.**

(b) **Ask the supervisor to check the circuit connection.**

(c) **Copy Table 1 into your answer booklet.**

Table 1

I_b(«A)	I_c(mA)
100	
200	
300	
400	
500	

(d) **Close switch Sw_2.**

(e) **Adjust V_{CC} until V_{CE} = 10 V.**

(f) **Close switch Sw_1.**

(g) **Adjust the variable potentiometer until I_b= 100 «A.**

(h) **Record in Table 1, the corresponding reading of I_C.**

(i) **Repeat steps (g) and (h) for the other values of I_b in Table 1.**

(j) **Plot a graph of I_C (mA) on the vertical asix against I_b(«A) on the horizontal axis.**

(k) **Determine the slope of the graph.**

The aim of this experiment was to determine the gain of a bipolar transistor. It also tested the effect on output of collect current (I_C) against variable base current (I_b) at a constant collector voltage (V_{CE}).
Majority of the candidates obtained good results and drew accurate graphs.
Majority of the candidates used different resistor values but had relevant and good results
Generally, candidates' performance was fair.

QUESTION 2

AIM: To obtain the common emitter output characteristics of a bipolar junction transistor.

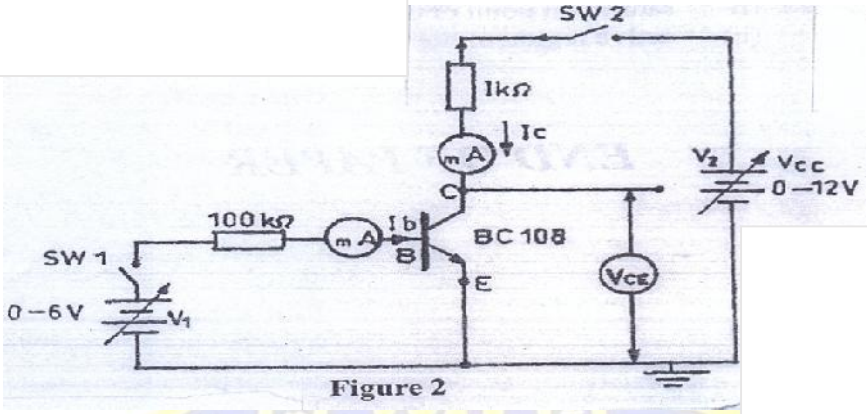


Figure 2

(a) Connect the circuit diagram as shown in figure 2.

(b) Ask the supervisor to check the circuit connection.

(c) Copy Table 2 into your answer booklet.

Table 2

V_{CE}(V)	1	2	4	6	8	
I_c(mA)						

(d) Close switches Sw_1 and Sw_2.

(e) Set I_b to 10«A by varying V_1.

(f) Adjust V_{CC} until the voltmeter (V_{CE}) reads 1 V.

(g) Read and record in Table 2 the corresponding value of I_C.

(h) Repeat steps (f) and (g) for the other values of V_{CE} in Table 2.

(i) Plot a graph of I_C (mA) on the vertical axis against V_{CE} (V) on the horizontal axis.

(j) From the graph drawn in (i), determine the

(i) saturation point of the transistor;

(ii) active region of the transistor.

Experiment 2 tested the effect on output collect current (I_C) against varying collector voltage (V_C) of a bipolar transistor at a constant base current (I_b). Few candidates deviated and therefore obtained values which were reverse results of the expected values. Majority of the candidates also failed to determine the saturation point and the active regions of the given transistor. Candidates' performance was generally good.

ELECTRONICS 2

1. **GENERAL COMMENTS**

The standard of the paper was good and comparable to that of the previous years. The overall performance of candidates compared with that of the previous years was generally fair.

2. **SUMMARY OF CANDIDATES' STRENGTHS**

(1) Majority of the candidates had a fair knowledge of communication (Television receivers).
(2) Majority of the candidates had a thorough understanding of cells.
(3) Candidates were able to draw circuit symbols correctly.
(4) Majority of the candidates stated basic functions of electronics components.

3. **SUMMARY OF CANDIDATES' WEAKNESSES**

(1) Candidates displayed very poor handwriting skills.
(2) Candidates lacked the technique and skill of responding to questions, hence their inability to attempt all questions.
(3) Majority of the candidates could not indicate any basic knowledge of the subject matter.

4. **SUGGESTED REMEDIES**

(1) Candidates should be guided to answer questions correctly.
(2) Schools should procure recommended textbooks (Electronics) for their students.
(3) Candidates should be encouraged to read widely on electronics textbooks.

(4) Candidates should be encouraged to use the internet to access electronics information to broaden their scope of knowledge.

5. **DETAILED COMMENTS**

QUESTION 1

(a) Explain how a bipolar transistor is constructed.
(b) State two applications of a transistor.
(c) Draw and label the circuit symbol of a/an
(i) npn transistor,
(ii) pnp transistor.

(a) Candidates response to the question was good, however few candidates were not able to explain how a bipolar transistor is constructed.

(b)&(c) Majority of the candidates were able to state the two applications of a transistor

without any difficulty and drew the symbols of NPN and PNP transistors respectively. The general performance of the candidates was good.

QUESTION 2

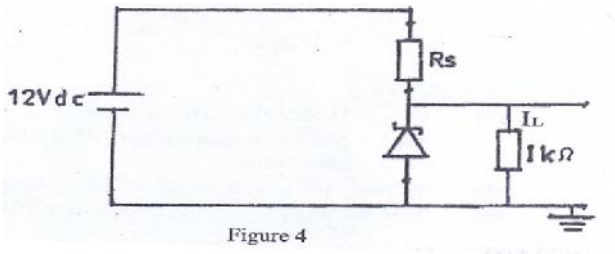


Figure 4

In Figure 4, a 5 V stabilised power supply is required from a 12 V d.c. input source. If the maximum power rating of the zener diode is 2 W, calculate the

(a) maximum current flowing in the zener diode,

(b) load current, I_L,

(c) value of the series resistor, Rs

(a)&(b) Majority of the candidates were able to calculate the current flowing in the zener diode and continued to obtain the load current (I_L) correctly.

(c) Majority of the candidates could not respond to this part of the question. The appropriate response is:

$I_S = I_Z + I_L$

$= 0.4 + 0.05$

$= 0.405A$

But $Rs = \frac{V_S - V_Z}{I_S}$

$= \frac{12-5}{0.405}\Omega$

$= 17.28\Omega$

QUESTION 3

(a) (i) Define the term cascading.

(ii) State one consequence of mismatching in amplifiers.

(b) Explain the operation of a Class A amplifier.

(c) List three types of coupling in amplifiers.

(a)(b)&(c) Majority of the candidates were able to define the term cascading but could not state one consequence of mismatching in amplifiers, some of the consequences of mismatching in amplifiers are:

(i) power loss
(ii) reduced gain, etc.

Majority of the candidates were able to explain the operations of a class A amplifier and listed the three types of coupling in amplifiers, i.e transformer, direct and RC coupling. Candidates' performance was fair.

QUESTION 4

(a) In a colour T.V. receiver, state the function of the following:
(i) r.f. tuner;
(ii) video amplifier;
(iii) video detector;
(iv) sync. separator.
(b) State the type of modulation used in television for the following:
(i) video;
(ii) sound.

(a)&(b) Majority of the candidates were able to state the functions of an r.f turner and video amplifier respectively, however, majority of the candidates could not respond to parts (iii) and (iv) respectively. A video detector detects or demodulates the amplitude modulated picture carrier whiles synchronizing separator, separates the pulses from the composite video signals.
Majority of the candidates responded very well to the type of modulation used in television for video and sound transmission.
Candidates' performance was fair.

QUESTION 5

(a) Define the following terms:
(i) permeability;
(ii) reluctance.
(b) Explain the difference between motor and generator principles.
(c) (i) State three applications of high permeability materials.
(ii) Give one example of a permeability material.

(a) Majority of the candidates could not define
permeability and reluctance correctly. The appropriate definitions are:
Permeability is the ratio of magnetic flux density to magnetizing force, whiles reluctance is the opposition offered by magnetic path to the flow of magnetic flux.

(b)&(c) Few candidates were able to explain the generator and motor principles correctly, but could not state the three applications of high permeability materials.
Candidates' performance was fair.

QUESTION 6

(a) State three differences between a primary cell and a secondary cell.
(b) List two types of primary cells.
(c) Name the electrolyte used in a secondary cell.

(a)(b)&(c) This was by far the most popular question amongst the candidates. Majority of the candidates were able to state the three differences between a primary and a secondary cell; listed the two types of primary cells and were able to state the electrolyte used in a secondary cell. Candidates' performance was very good.

QUESTION 7

(a) Draw a 3-input diode logic OR gate.
(b) Sketch the switching arrangement for a 2-input logic OR gate.
(c) Construct a truth table for the logic gate in (a) above.
(d) Sketch the symbol for the logic gate in (a) above.

(a)(b)(c)&(d) Majority of the candidates could not respond to the (a) part of this question. Candidates were able to sketch the switching arrangement for a 2-input logic OR gate and constructed the truth table correctly.
Majority of the candidates were able to draw the symbol for the logic gate.
Candidates' performance was generally very good.

METALWORK 1

1. GENERAL COMMENTS

The general performance of candidates was up to the expected standard as compared to previous years' performance. The paper was prepared within the scope of the specified syllabus and the level of difficulty was suitable.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Some candidates produced clean finished work.
(2) Candidates' skill in cutting had improved.
(3) Many candidates understood the question and could interpret the detailed drawing and to realise the expected product or the assembled parts.
(4) Some candidates had developed fairly good control of filing to the specified dimensions.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) A lot of the candidates lacked the basic skills to produce good work.
(2) Candidates failed to mark out profiles/outlines/patterns of work to be produced.
(3) Dot punching was neglected in most cases.
(4) Candidates lacked the right method of chiselling.
(5) Mismatching or misalignment of parts to be assembled with set screws were seen in many cases.
(6) Some candidates failed to tie labels to the finished work and cotton bags were made very small in size to contain the finished work.

4. SUGGESTED REMEDIES

(1) Candidates should be taught basic skills in Bench Fitting - including filing, hacksawing, chiselling, marking out and debarring.
(2) Students should be given many different exercises as practice within the period of study.
(3) Candidates should be made to draw the detailed drawings involving the exercises themselves to inculcate in them correct draughting practices.
(4) Candidates should be encouraged to observe safe working practices.

5. DETAILED COMMENTS

Candidates were required to attempt one out of two practical questions - Test A and Test B covering bench fitting exercise and lathe machining exercise respectively.
For Test A, the following materials were supplied
- one flat mild steel plate, 105 mm x 125 mm x 3 mm (2 off)
- set screw, M6 (2 off) and a cotton bag 80 mm x 110 mm to parcel the finished items.
The Test A consisted of Part A, Part B, Part C and the Assembly.

Part A

Candidates were expected to cut and file to obtain a
rectangular projection at the top and a Vee slot at the base. These shapes were to be produced accurately with a tolerance of ±0.5 mm per the given dimensions.
In obtaining these shapes, candidates were required to mark out on the given plate correct shapes of the Part A.
Candidates then dot punch and centre punch on the marked or scribed lines and the centre point for the hole ∅6 mm to be drilled. Having done these, candidates ought to hacksaw through the dot punched lines, fairly close to enable finish filing to be carried out after the cut.

Part B

Similarly, the Part B should be marked out to define the accurate profile of component part. After the marking out, candidates were expected to dot punch through the scribed lines before cutting out with hacksaw and chisel. The inner part of the rectangular slot could first be drilled with chain of holes to facilitate cutting with chisel. Upon obtaining the shape or pattern, the part could be cleaned with smooth file to get to the specified shape.
Many candidates failed to mark out the shapes of the parts hence their inability to obtain accurate and close dimensions of the work. Candidates who followed the outlined steps obtained good results.

Part C

Candidates were expected to mark out for the shape with the specified dimensions. The scribed lines defining the outline should be dot punched before cutting out with hacksaw. The cut surfaces should be filed with smooth to remove excess metal and burrs for safe handling.
After obtaining these parts - candidates ought to assemble the parts in their correct positions, clamped down with appropriate end/edge clamps before drilling the two holes together through all the parts to ensure proper alignment of the parts. With appropriate tapping hole size, the second and the plug taps could be used to complete the thread in the part C. For clean and safe work, the smooth file could be used to remove all sharp edges and projecting burrs.
The parts A, B and C ought to be assembled with the two sets screws specified in the material list.

Test B - Machining

Candidates were supplied with one piece free cutting mild steel rod, ∅50 mm x 85 mm to produce the component part shown in the detailed drawing.
Candidates were required to turn, drill and bore and perform a diamond knurling on the shoulder ∅50 x 50 mm.

Candidates ought to perform all these operations on the centre lathe. First, the workpiece should be firmly gripped in the three jaw chuck - for easy mounting. One end of the piece should be faced out and turned the opposite end in the chuck after centre drilling using combination centre drill for similar operations to be carried out. When these operations had been done, the work should be step-turned u to ∅40 x 20 mm and ∅48 x 20 mm leaving the shoulder length 50 mm to be knurled on the 50 mm diameter. After performing these operations, the work should be removed between centres and held in the three jaw chuck again for the hole ∅39 mm to be drilled and bored. After completing these operations, the edges of the part ends should be chamfered and debarred.

METALWORK 2

1. GENERAL COMMENTS

The standard of the paper was good and compared favourably with that of previous years. Candidates' performance was satisfactory.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Candidates attempted the required number of questions.
(2) Answers provided by some candidates were good.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Some candidates could not sketch properly.
(2) Some candidates could not list steps in sequential order involved in sand casting from mould preparation to fettling.

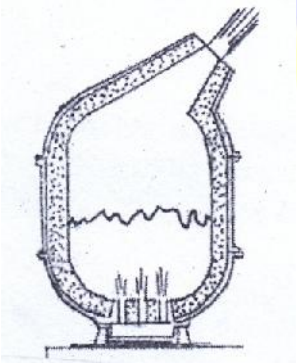
4. SUGGESTED REMEDIES

(1) Teachers should give enough sketching exercises to candidates.
(2) Practical exercises in sand casting should be organised for candidates.

5. DETAILED COMMENTS

QUESTION 1

(a) State two precautions to be observed when using oxy-acetylene gas.
(b) The sketch below is a type of furnace.



(i) Identify the type of furnace.
(ii) State what is produced from the furnace.
(iii) List two constituents of the charge fed into the furnace.
(c) List two cutting fluids used on the bench.
(d) State three lathe operations.

(a) Performance generally was good for this question.

(b) (i) Some candidates could not identify the type of furnace shown in the sketch. The furnace is the Bessemer converter.

(ii) Majority of the candidates could state that the furnace in question 1(b)(i) is for the production of mild steel.

(ii) This part of the question was well answered.

(c) Candidates could list two cutting fluids used on the bench.

(d) Candidates performed well in this part of the question by including: knurling, chamferring, facing, parting-off and thread cutting in their answers.

QUESTION 2

(a) Sketch the following rivet heads:
(i) flat;
(ii) pan.
(b) State the use of each type of rivet in (a)(i) and (a)(ii).
(c) Explain the following design principles:
(i) unity;
(ii) harmony;
(iii) rhythm.
(d) State one example of an active flux.

(a) Generally, the performance was average.

(b) Some candidates could not state the use of each of the rivet heads sketched in question 2(a). The flat head is used for thin sheet work, and the pan head is used for decorative work in sheet metalwork.

(c) Majority of the candidates could not explain the given design principles.

(d) Performance of candidates in this part of the question was good because they could include Zinc Chloride, tallow, borax, hydrochloric acid and Ammonium Chloride in their answers.

QUESTION 3

(a) (i) Sketch a trammel.
(ii) State the use of trammels.
(b) List five steps in sequential order involved in sand casting from mould preparation to fettling.

(a) (i) Majority of candidates could not sketch a trammel.
(ii) Candidates could state the use of trammels.

(b) Majority of the candidates could not list the five steps in sequential order. Candidates were to include the following:
- Prepare the mould
- Melt the metal
- Pour molten metal into mould
- Allow the content (i.e. metal) to solidfy
- Remove the casting from the mould for fettling

QUESTION 4

(a) State one reason for carrying out each of the following heat treatment processes:
(i) tempering of cold chisel after hardening;
(ii) annealing a metal after raising.

(b) Explain how to harden and temper a cold chisel in a workshop.

(c) List three hand forging operations.

(d) State one distinct feature that differentiates the hand file from the flat file.

(a) (i) Tempering a cold chisel after hardening: The reason is to take away some of the brittleness and make the tool tough and strong for effective cutting.
(ii) Annealing a metal after raising: The reason is to relieve internal stresses and soften it.

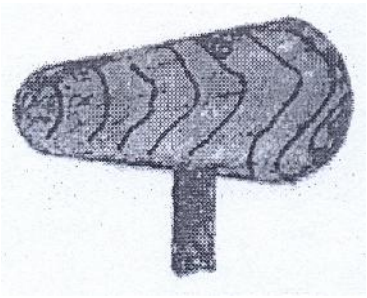
(b) Explaining how to harden and temper a cold chisel in a workshop was satisfactorily done.

(c) Candidates could list three hand forging operations.

(d) This part of the question was not convincingly answered. Candidates were to state one distinct feature that differentiates the hand file from the flat file. Some provided sketches to differentiate the two files instead of state the differences. A hand file has one edge smooth and has parallel sides whereas the flat file tapers in width and thickness and has no safe edge.

QUESTION 5

(a) The sketch below shows a beaten metalwork tool.



(i) What is the name of the tool?
(ii) State one use of the tool.

(b) (i) Explain the term polishing in metal finishing.
(ii) Describe blueing process in metal finishing.
(c) Describe how to tap a blind hole.
(d) Why does a hacksaw blade cut on forward stroke only?

(a)(i-iii)Majority of the candidates could not name the tool in the figure as the Bossing mallet which is used for shaping internal curves and hollowing in sheet metal.

(b) (i) Polishing in metal finishing involves using abrasive materials on the surface of a metal to make it smooth. Some candidates could not provide this explanation.

(ii) This part of the question was well answered.

(c) Candidates could describe how to tap a 'blind hole'.

(d) Majority of the candidates could explain the reason why hacksaw balde cuts on the forward stroke only.

TECHNICAL DRAWING 1

1. **GENERAL COMMENTS**

The question paper fairly covered as much of the syllabus as possible. The standard of the question was generally satisfactory and quite comparable with the standard of the previous years.

The general performance of the candidates was below expectations. Some responses indicated rote learning as well as lack of knowledge of basic principles in geometric construction.

2. **A SUMMARY OF CANDIDATES' STRENGTHS**

(1) The quality of line work shows improvement which must be encouraged.
(2) Candidates generally demonstrated adequate knowledge in reading and interpretation of multiview orthographic projections.
(3) Majority of the candidate demonstrated satisfactory knowledge and skills in the construction of isometric drawing from given multiviews in orthographic.
(4) Candidates demonstrated a fair knowledge in the construction of surface development of right pyramid.
(5) Candidates' responses indicated satisfaction in the use of scales for geometric construction.

3. **A SUMMARY OF CANDIDATES' WEAKNESSES**

(1) Inadequate knowledge of the importance and the correct symbol for centre line.
(2) Candidates lacked the knowledge for the construction of curves of intersections and interpenetration of solid.
(3) Inadequate knowledge of the principles and construction of locus of a moving point.
(4) Most candidates lacked the principle of lines and plane surfaces.

4. **SUGGESTED REMEDIES**

(1) Teachers should teach general principles for the construction of locus of moving point.
(2) Teachers should teach the principles of construction of polygons of forces for members of framed structure and the rules for the determination of nature of stresses (tie or strut).
(3) Teachers should encourage candidates to read questions thoroughly before answering.
(4) Teachers should endeavour to teach the geometrical principles required by the syllabus before applications to solve problems.

5. **DETAILED COMMENTS**

QUESTION 1

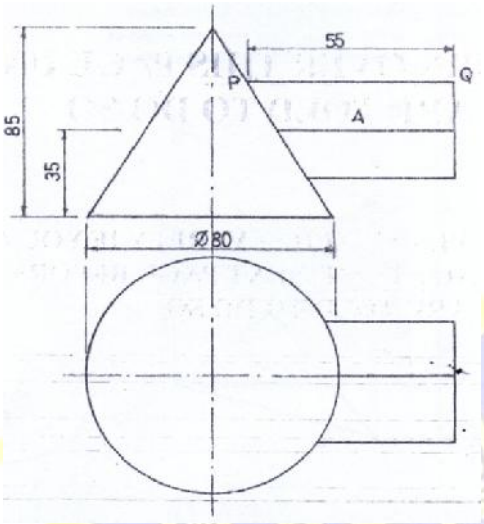
A square pipe penetrates a right cone as shown below:

(a) copy the given view;

(b) draw the :

(i) curve of interpenetration;

(ii) development of the square pipe using PQ as seam.



Majority of the candidates attempted this question.

Candidates could only drew the given elevation and plan of the vertical cone. Quite a number of the candidates could not construct correctly the end view of the square pipe, as a result, they could not project the correct elevation and plan of the horizontal square pipe.

Almost all the candidates demonstrated lack of knowledge for the construction of the curves of intersection of the two solids. Few candidates made attempts to construct the curves on the elevation and virtually all could not construct the curves in the plan. Candidates' performance was generally poor.

QUESTION 2

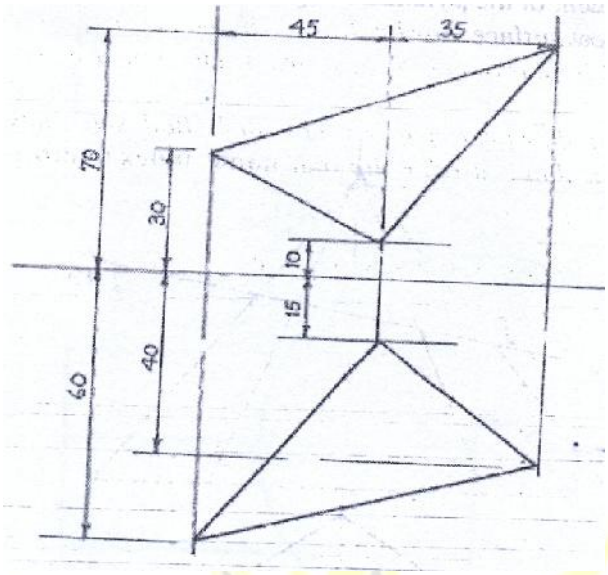
(a) The plan and elevation of a triangular lamina are given below:

(i) copy the given views;

(ii) draw the true shape of the lamina;

(iii) state the true length of the sides;

(iv) measure and state the true angle of inclination to the horizontal plane.

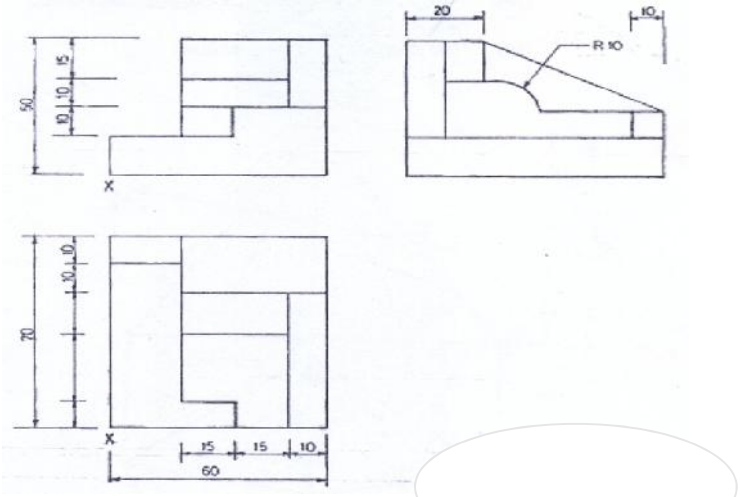


(b) The centres of two circles of diameter 30 and 20 respectively are 70 apart. Plot the locus of a point equidistant from the circumference or each circle.

Very few candidates answered the question and the performance was poor. Generally candidates could only copy the given views of the triangular lamina and in many instances copied wrongly. This demonstrates lack of knowledge of the candidates in this area of the syllabus.
In part (b) candidates were to construct the locus of a point which is equidistant from the circumference of each circle. Few candidates attempted this part of the question. Candidates drew the two eccentric circles wrongly.
Candidates' performance was poor.

QUESTION 3

Three views of a block are given in first angle projection below. Draw the block in isometric view with X as the lowest point. (Hidden details are not required).



This question was quite popular amongst the candidates. Candidates demonstrated the following strengths in their responses:

(i) Adequate knowledge in reading orthographic projections.

(ii) Candidates' performance was average.

QUESTION 4

The elevation and an incomplete plan of a truncated pentagonal pyramid are given in the figure below:

(a) Copy the given view.

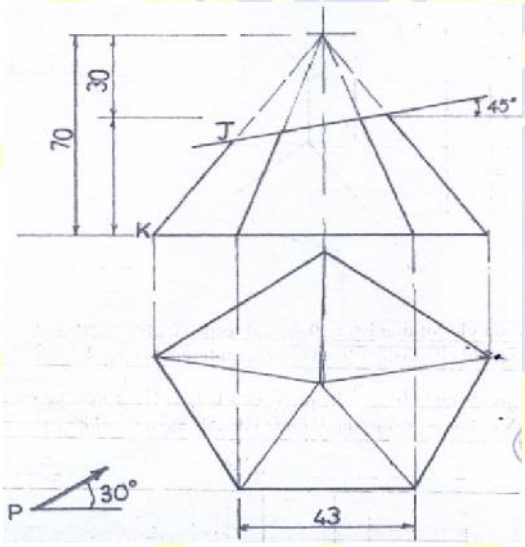
(b) Draw the:

(i) complete plan;

(ii) auxiliary elevation in the direction of arrow P;

(iii) surface development of the pyramid using JK as the seam;

(i) the shape of the cut surface.



This was also a very popular question amongst the candidates. The performance was far below average and expectation.

The three main strengths in the answers of the candidates were:

(i) Ability to construct a pentagon as the plan of the pyramid.

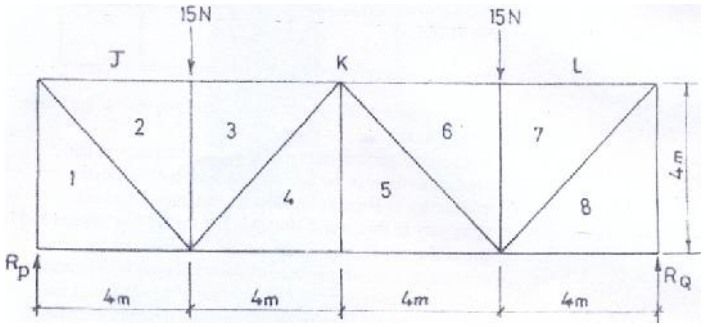
(ii) Knowledge of projection of elevation of the plan.

(iii) Demonstration of knowledge of surface development of pyramid.

Candidates failed to draw the correct angle of the cutting plane in the elevation, lacked the knowledge of projection of auxiliary view in a given direction.

QUESTION 5

A framed structure of span 16 cm and height 4 m is shown below.



(a) Using a scale of 1 mm = 0.1, draw the framed structure and label with Bow's Notation as indicated.

(b) With a scale of 1 mm = 0.5 N,

(i) Determine graphically the magnitude of the reactions R_P and R_Q;

(ii) Construct the force diagram for the members;

(iii) Using the table below, state the magnitude and the nature of the forces in the members indicated.

MEMBER	**J – 1**	**J – 2**	**M – 1**	**I - 2**
FORCES				
NATURE				

The responses to the question were very popular in the scripts of the candidates. The general performance was average. Majority of the candidates drew to the correct scale and had adequate knowledge of lettering by Bow's notation, recognised symmetry in the framed structure and the loading system and hence the two reactions being equal. Majority of the candidates were able to use funicular polygon to determine reactions at the supports; but lacked the knowledge of the principle and rule for the determination of nature of stresses, i.e either tensile (tie) or compression (strut). Candidates' performance was generally fair.

TECHNICAL DRAWING 2

1. GENERAL COMMENTS

The standard of the paper compared favourably with that of the previous years.
The performance of the candidates as compared to that of the previous years was at par.
Generally, the performance of candidates in both building and mechanical drawings have improved.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Majority of the candidates' pencil work was neat.
(2) The draughtmanship skills of most of the candidates was encouraging.
(3) Candidates drew to the correct scales demanded by the rubric.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Most of the candidates work showed weakness in the drawing or pictorial views using freehand.
(2) Candidates could not represent properly the correct type of pencils for different drawings, i.e. sketches, construction and outlines.
(3) Candidates could not use correct representative symbols for component parts.
(4) Sectioning skills was generally poor in the mechanical drawing.

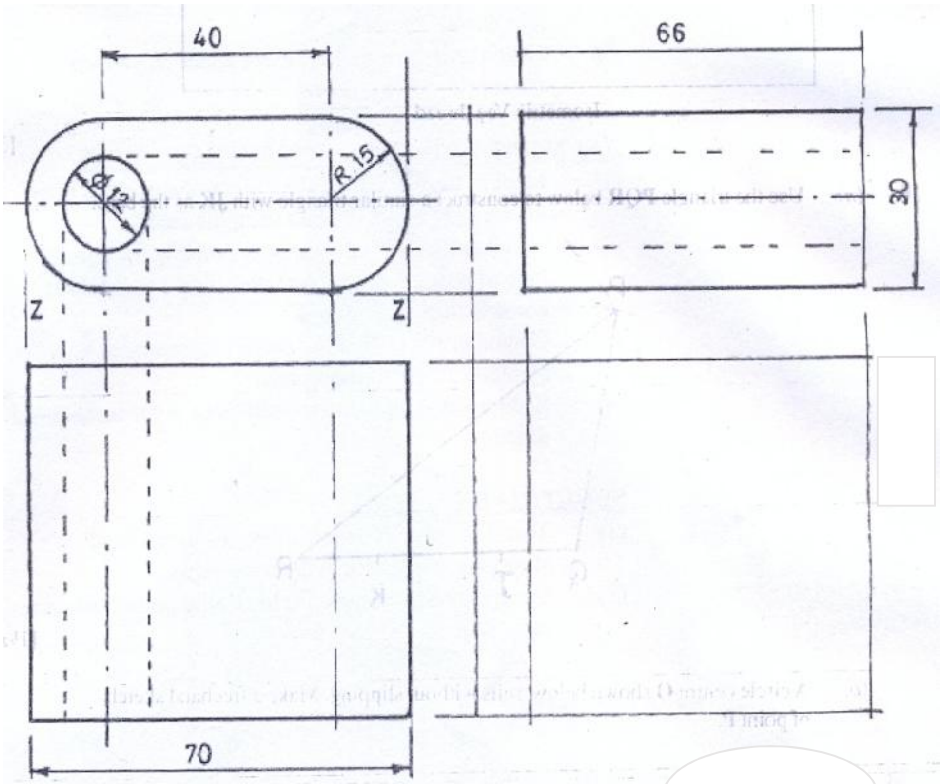
4. SUGGESTED REMEDIES

(1) Teachers must give more exercises in freehand sketching, especially in the basic tools.
(2) Candidates should practise the techniques of hatching parts using the 45° set square.
(3) Teachers are to employ real components to illustrate orthographic projections principles.

5. **DETAILED COMMENTS**

QUESTION 1

Three views of a bracket are shown in first angle below. Make a freehand sketch of the isometric view of the bracket, approximate full size, with face ZZ as the lowest.



Majority of the candidates found it difficult to use the lowest point ZZ as the reference point. Most of the candidates used drawing instruments and straight edge to draw instead of using freehand, moreover, most of the responses lacked good linework.
Few candidates found it difficult to draw the arcs. Candidates' performance was generally average.

QUESTION 2

Make a freehand pictorial sketch of a try square.

Majority of the candidates sketched the try square but forgot to show the special features of the try square, i.e. stock thickness and the blade thickness.
Most candidates did not use freehand in sketching, instead used straight edge. Few candidates could also not identify the tool. The performance was generally good.

QUESTION 3

Make a freehand pictorial sketch of a G-clamp.

Candidates did well by identifying the tool. Most of the candidates were able to sketch the tool. Few of the candidates could not sketch in pictorial form. Candidates' performance was good.

QUESTION 4

A sketch plan of a bungalow was given. A specification from foundation to roof was also given to guide candidates.

Candidates were then demanded to draw to a scale of 1:100, the floor plan and rear elevation of the bungalow.

They were also to draw to a scale of 1:5 the sectional elevation on plane P-P. Majority of the candidates provided good drawings as answers to the question. The draughtmanship of most of the candidates was very good. They adhered to the principles of the BS 1100. Few candidates could not answer the question as demanded by the rubrics, the rear view and the detailed cross-section. Candidates drew the front elevation as the rear elevation or it not attempt. The general performance was fair.

QUESTION 5

Two views of a machine assembly was provided.
Candidates were demanded to draw in first angle projection the following views: A sectional front elevation on the specified plane, an end elevation in specified given direction and a plan.

Majority of the candidates drew to the correct scale. Candidates provided good drawing as answers. The plan which was not provided was a challenge to most of the candidates, sectioning was not well done. Likewise centre lines were not properly drawn. The general performance of the candidates was good.

WOODWORK 1

1. GENERAL COMMENTS

The standard of the paper as a whole was comparable to that of the previous years. All the questions were based on the syllabus and were of the acceptable level of difficulty.
The performance of candidates as compared to that of the previous years was average.

2. SUMMARY OF CANDIDATES' STRENGTHS

A few of the candidates were able to interpret the working drawings, marked-out correctly and produced an excellent work worth emulating by others.

3. SUMMARY OF CANDIDATES' WEAKNESSES

(1) A few candidates could not read and interpret the working drawings correctly.
(2) Some candidates could not mark-out and cut-out accurately.
(3) Most candidates failed to use well sharpened cutting tools.

4. SUGGESTED REMEDIES

(1) Tutors should emphasis on the teaching of orthographic drawings.
(2) Teachers should give enough practical exercise which involve the reading and interpretation of working drawings.
(3) Teachers should instill in students the readiness to apply correct procedure, skills and techniques of accurate sawing and chiselling.

5. DETAILED COMMENTS

QUESTION 1

Candidates were given working drawings of a model of a picture frame. They were required to interpret the drawing and construct the model using already prepared workpieces.
The work involved the following processes:

(a) construction of long and short shoulder stub mortise and tenon joints;
(b) construction of a dovetail tee halving joint;
(c) construction of a tee briddle joint;
(d) rebating;
(e) bevelling;
(f) assemblying;
(g) dressing.

(a) Long and Short Shoulder Stub Mortise and Tenon Joint
Very few candidates were able to mark-out accurately even though majority of them attempted the question. A few candidates however constructed ordinary

mortise and tenon joint. A good number of the candidates lacked the requisite skills to cut clean the sides and ends of the mortises.

(b) Dovetail Tee Halving Joint

Candidates performed quite creditably in this question. A few candidates however could not mark-out the dovetails accurately. The acceptable pitch for dovetails is from 1:6 to 1:8. Some of the candidates made the necks of the tails too narrow and consequently got broken in the process of assembling or dismantling the work for marking.

(c) Tee Briddle Joint

Candidates' performance in this question varied from high to low. Those who could read and interpret the drawing marked-out correctly and constructed very good joints. A few candidates however deviated and constructed a tee halving joint instead of a tee briddle joint.

(d) Rebating

Majority of candidates appeared to have used blunt cutters or very hard interlocked grain workpieces and as a result found it extremely difficult to perform any meaningful job.

(e) Bevelling

Majority of the candidates were able to shape the required bevelling on the stiles.

(f) Assemblying

Majority of candidates were able to assemble their work; a few however could not assemble but tied the workpieces together for easy identification. A small number of candidates neither assembled nor tied their work, they left the pieces mixed up in the boxes with some poorly labelled and others not labelled at all.

(g) Finishing

All the candidates failed to dress their work to give it the needed appeal.

WOODWORK 2

1. GENERAL COMMENTS

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

2. SUMMARY OF CANDIDATES' STRENGTHS

(1) Candidates produced very good freehand pictorial sketches and orthographic drawings.
(2) Most candidates exhibited good draughtsmanship.

3. SUMMARY OF CANDIDATES' WEAKNESSES

(1) Candidates could not distinguish between a box and a cabinet hence majority of candidates deviated in their sketch of the jewellery box.
(2) Candidates could not provide the expected decorations on the box.
(3) Candidates did not show the cutting plane on the end elevation.

4. SUGGESTED REMEDIES

Candidates should be given adequate exercises on design and drawing to enable them acquire the necessary skills for the required level of performance.

5. DETAILED COMMENTS

A lockable decorative box has the following specifications:
Overall dimensions in millimeters:
Width - 300
Depth - 250
Height - 100.
The box has three compartments for storing jewellery. Design the box to meet the specifications.

QUESTION 1

Make two preliminary freehand pictorial sketches, each showing a different design of the box.

FREEHAND PICTORIAL SKETCHES

Majority of candidates presented designs that agreed with the required specification. A few however used drawing instruments instead of freehand to produce the preliminary sketches.

QUESTION 2

Select one of the sketches in Question 1 and to a scale of 1:2, draw in the First Angle Orthographic projection the:

(a) front elevation;
(b) end elevation;
(c) sectional front elevation.

(a) FRONT ELEVATION

All the candidates attempted this question and placed the views in their proper planes. Majority of candidates showed all the features except the decorations. A few however failed to show the joints, partitions, lock, handle, hinges, dimension and names of the views.

(b) END ELEVATION

Majority of candidates performed creditably with this question. A few however failed to indicate the door or lid, cutting plane, side pieces, bottom piece and decoration.

(c) SECTIONAL FRONT ELEVATION

Majority of candidates who attempted this question performed very well. Most of them failed to position the following parts appropriately: partition in section, top lid in section, bottom piece in section and appropriate convention of shading materials.

QUESTION 3

Illustrate with enlarged sketches the method of decoration used on the box.

ENLARGED SKETCHES ON DECORATIONS

Majority of candidates failed to draw the enlarged sketches of the method of decorations used on the jewellery box. A few of the candidates who attempted the question omitted the names of the decorations drawn.

WOODWORK 3B

1. **GENERAL COMMENTS**

The paper compared favourably with those of the previous years, the questions were standard and covered all aspects of the syllabus. The general performance of candidates was below average compared to that of last year.

2. **SUMMARY OF CANDIDATES' STRENGTHS**

(1) Most candidates had a fair idea about the questions and understood them.
(2) Most candidates were able to answer question 2(b) very well.

3. **SUMMARY OF CANDIDATES' WEAKNESSES**

(1) Most candidates could not spell simple words and construct simple sentences to answer questions.
(2) Most candidates produced poor sketches.

(3) Even though most candidates seem to understand the questions, they lacked the approach to answer the questions.

4. **SUGGESTED REMEDIES**

Candidates should be given adequate exercises on design and drawing to enable them acquire the necessary skills for the required level of performance.

5. **DETAILED COMMENTS**

QUESTION 1

(a) State the specific use of each of the following hand tools:
- **(i) panel saw;**
- **(ii) compass saw;**
- **(iii) bullnose plane;**
- **(iv) slipstone.**

(b) Name a safety device used when:
- **(i) turning;**
- **(ii) ripping on a circular saw;**
- **(iii) sweeping the workshop;**
- **(iv) grinding plane cutter.**

(c) Name the portable power tool used for each of the following operations:
- **(i) drilling;**
- **(ii) crosscutting;**
- **(iii) sanding;**
- **(iv) grooving.**

(d) (i) List two tools required for setting out a mortise and tenon joint.
(ii) State the specific use of each of the tools listed in (d)(i).

(a) Candidates' responses to this question was mixed. They could not state the use of the stated handtool well. Among them:
   (i) Panel saw is used for sawing thin timber across the grain.
   (ii) Compass saw is used for cutting large interior and exterior curves.
   (iii) bullnose plane cleaning/levelling rebates.
   (iv) Slipstone is used to sharpening tools with curve cutting edges.

(b) A few candidates were able to name the safety device used when:
   (i) turning - goggle/eye shield, nose mark
   (ii) ripping on a circular saw - Nose mask/push stick
   (iii) sweeping the workshop - respirator
   (iv) grinding plane cutter - goggle

(c) Majority of candidates were able to answer this question very well.

(d) Most candidates seem not to have understood this question and therefore stated just any tool. The required answers include mortise gauge, metric rule, try square, pencil.
   - Metric rule is used for measuring distances
   - Pencil - for marking lines on a stock
   - Mortise gauge - gauging mortises and tenons

QUESTION 2

(a) State one cause of each of the following timber defects:
   (i) interlocked grain;
   (ii) cupping;
   (iii) waney edge;
   (iv) thunder shake.

(b) State three advantages of kiln seasoning over air seasoning.

(c) The table below shows incomplete information about two West African timbers. Copy and complete the table.

Timber	Colour	Best Use
(i) Iroko		
(ii) Obeche		

(d) State one use of an escutcheon.

(a) Most candidates could not answer this question satisfactorily. The required answers include:

(i) Cupping - caused by shrinkage, poor or bad stacking.
(ii) Waney edge - caused by inadequate edging boards during conversion.
(iii) Interlocked grain - occurs when the fibres of adjacent layers in the growth rings are inclined at different angles to the axis of the timber.

(b)&(c) Most candidates answered this question very well.

(d) Most candidates did not answer this question and those who attempted deviated.

The escutcheon is used mainly to protect or prevent the wearing of keyholes; it may also serve as a decoration.

QUESTION 3

(a) State where each of the following materials is best used:
(i) oil paint;
(ii) varnish;
(iii) lacquer;
(iv) creosote.
(b) (i) Sketch a round head woodscrew.
(ii) Indicate the length of the screw in (a)(i).
(c) Sketch the cross-section of a blockboard.

(a) Most candidates answered this question but was not properly answered. Oil paint and creosote were well answered, whiles varnish and lacquer were not properly answered.

- Varnish is used on internal furniture that may come into contact with heat.
- Lacquer is used on internal furniture where the natural colour and beauty are to be maintained.

(b) Most candidates were able to sketch the round head woodscrew. A few however could not indicate the length of the screw.

(c) Most candidates did not answer this question and those who attempted did poorly.

QUESTION 4

(a) (i) List four methods of decorating surfaces with veneers.
(ii) Illustrate with sketches two of the methods listed in (a)(i).
(b) State two methods of securing a tenon in its mortise without using glue.
(c) List four stuffing materials used in upholstery.
(d) List two types of turning operation performed on the lathe.

(a) Most candidates did not answer this question and those who attempted got it wrong. The required answers include:
- side to side; end to end; four piece; diamond; herring-bone; segmental.

(b) Majority of candidates could not answer the question well. The required answers include: wedging; foxtail wedging; drawboring; dowelling; nailing; screwing.

(c) Most candidates could not answer this question well. They mistook covering materials for stuffing materials. The required answers include: feather; synthetic foam; cotton; grass; latex foam.

(d) Most candidates could not answer this question well. The required answers include: face plate turning/face turning; boring in the lathe; cup chuck turning.