TECHNICAL SUBJECTS

RESUME OF TECHNICAL SUBJECTS

(1) PERFORMANCE OF CANDIDATES

The Chief Examiners for Building Construction 2 and 3, Technical Drawing 2 and 3, and ICT 2 and 3 reported that the candidates' performance improved. The performance of candidates in Auto Mechanics 2 and 3, Electronics 2 and 3, Metalwork 2 and 3, and Woodwork 2 and 3 declined. Candidates' performance in Applied Electricity 2 and 3 was above average.

(2) SUMMARY OF CANDIDATES' STRENGTHS

(a) Orderly Presentation of Answers

The Chief Examiners for Building Construction 2, Woodwork 2 and Technical Drawing 3 reported that, some candidates had their work well numbered and properly spaced out for easy reading.

(b) Demonstration of In-depth Knowledge of Subject Matter

It was reported that a few candidates showed excellent knowledge in the subject matter. Most candidates presented good quality line work in Technical Drawing 2 and demonstrated good knowledge in Orthographic projection in Technical Drawing 3. Candidates for Technical Drawing 3 were said to have demonstrated 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. In Auto Mechanics 3, most candidates demonstrated good skills in removing and dismantling the brake master cylinder.

(c) Demonstration of Practical Skills

The Chief Examiners for Woodwork 3 and Metalwork 3 reported that; candidates demonstrated appreciable skills in marking-out, chiselling and cutting to specified dimensions. Most candidates offering Auto Mechanics 3 were reported to have observed basic workshop and personal safety rules.

(d) Adherence to Rubrics

The Chief Examiners for Building Construction 3, Woodwork 2, Technical Drawing 3 and ICT 2 commended candidates for adhering to the rubrics of the papers. The Chief Examiner for Metalwork 2 applauded candidates for answering the required number of questions.

(e) Exhibition of Skills in Drawing

The Chief Examiners for Woodwork 2 and Building Construction 3 praised the candidates for producing neat freehand pictorial sketches. It was also reported in Technical Drawing 2 that most of the candidates used the correct grade of pencils and clearly distinguished outlines from construction lines.

(f) Legibility of Handwriting

The Chief Examiners for Auto Mechanics 2 and Building Construction 3 praised the candidates for showing remarkable improvement in handwriting which made their work neat and readable.

(3) SUMMARY OF CANDIDATES' WEAKNESSES

(a) Lack of Adequate Preparation

The Chief Examiners reported of candidates' responses and activities that demonstrated inadequacy in their preparation. Candidates failed to sharpen cutting tools in Woodwork 3.
In Metalwork 3, failure to provide reasonable size of cotton bag to enclose the finished workpiece.

(b) Lack of In-depth Knowledge of the Subject Matter.

Some candidates showed weaknesses in different areas of their subject. In Technical Drawing 3, most candidates could not section, or cut portions of components. In Technical Drawing 2, pencil work of some candidates was very poor and most candidates could not trace the locus of a point. Most candidates of Metalwork 3 lacked the ability to deburr and remove sharp edges of filed faces. Most candidates in Building Construction 3 had poor application of sectioning symbols to the walls, concrete floor slab, cement-sand screed, etc.

(c) Non-Adherence to the Rubrics of the Examination

Some candidates failed to observe the simple instructions as demonstrated by candidates' failure to draw border lines and show the cutting plane on the front elevation in Woodwork 2.

(d) Lack of Practical Exposure

In Auto Mechanics 2, candidates' weaknesses were reported in their poor concept of the operation of the four-stroke compression ignition engine. Some candidates of the subject could not select the correct tools for the correct job while some had problems fixing parts they had removed. Most candidates of Metalwork 3 lacked the competence in machining and manipulation and use of Centre lathe machine. A few candidates of Woodwork 3 were unable to mark out accurately and work to the given dimensions. Most candidates offering Auto Mechanics 3 could not identify the check valve in the master cylinder.

(e) Poor Sketches

Most candidates produced poor sketches as demonstrated in unproportioned drawings produced in Technical Drawing 3. In Auto Mechanics 2, most candidates produced poor sketches of the poppet valve and the parallel circuits, and most candidates of Metalwork 2 could not produce neat sketches.

(f) Poor Handwritings

The Chief Examiners for ICT 2, Auto Mechanics 2 and Building Construction 3 bemoaned the illegible handwriting of most candidates.

(4) SUGGESTED REMEDIES FOR THE WEAKNESSES

The following were suggested as remedies for the weaknesses:

(a) Teachers and instructors should regularly visit workshops with students to familiarize themselves with what goes on in the world of work.

(b) Candidates should be encouraged to prepare very well for the examination by securing the required equipment and materials for Auto Mechanics, Metalwork and Woodwork Practicals.

(c) Candidates should be impressed upon to always read and observe the dictates of the rubrics of the examination.

(d) Teachers should endeavour to complete all sections of the syllabus before the examination.

(e) Teachers should have all the necessary tools and equipment and instruments including textbooks for the training of students.

(f) Candidates should read over their solutions to enable them correct errors such as omissions, poor spellings and poor handwriting.

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

APPLIED ELECTRICITY 2

1. GENERAL COMMENTS

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

Candidates' performance was slightly better compared to that of the previous year.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Majority of the candidates answered the question on colour coding of resistors satisfactorily.
(2) Majority of the candidates drew the phasor and wave diagrams.
(3) Majority of the candidates knew the various methods of wiring and earthing.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Majority of the candidates could not draw the diagram to explain Fleming's left hand rule.
(2) Majority of the candidates had difficulty defining integrated circuit, listing types of it and stating its applications.
(3) Most candidates demonstrated weak knowledge in Electronics.

4. SUGGESTED REMEDIES

(1) Candidates should read more literature on Applied Electricity to improve their level of understanding of the subject.
(2) Adequate exercises should be given to students.
(3) Candidates should revise extensively before examinations are taken.

5. DETAILED COMMENTS

QUESTION 1

Three resistors X, Y and Z have the following colours codes:

Resistor	Colour code
X	Red, Red, Brown, Silver
Y	Yellow, Violet, Brown, Gold
Z	Green, Blue, Brown

(a) State the values of resistors X, Y and Z.
(b) State **two** differences between *Carbon* and *Wire wound* resistors.

Most candidates attempted this question.

(a) A good number of the candidates were able to state the values of the resistors listed. The values of the resistors listed are:

X (Ω): 220 ± 10% OR $22 \times 10^1 \pm 10\%$

Y (Ω): 470 ± 5% OR $47 \times 10^1 \pm 5\%$

Z (Ω): 560 OR 56×10^1

(b) Some candidates could not differentiate between carbon and wire wound resistors. Differences between Carbon and Wire wound resistors:

- Wire wound resistor is used for power rating above $5\ W$ while carbon resistor is used for power rating less than $5W$.
- Carbon resistor uses colour codes for representing values while wire wound values are printed on the body.
- Wire wound resistor is made from ceramic and wire while carbon resistor is made from carbon and wire.
- Carbon resistor is suitable for high frequency circuits while wire wound resistor is not.
- Carbon resistor has low temperature coefficient while wire wound resistor has high temperature coefficient.
- Carbon resistor of less than 2Ω is difficult to produce while wire wound resistor is easy to produce for very low values.

QUESTION 2

(a) State **one** function of a choke in fluorescent lamp.

(b) When an alternative voltage is applied to a circuit, the current produced lags the voltage by an angle ϕ. Illustrate this statement by means of:

(i) wave diagram

(ii) phasor diagram

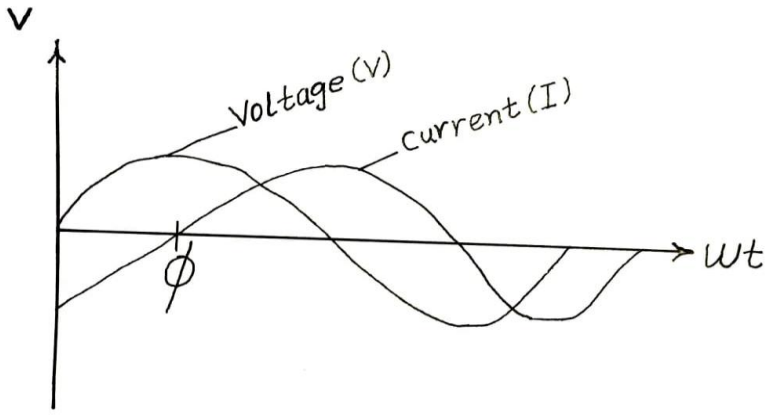
(c) State the effect of frequency increase on current flow in an inductive circuit.

(a) Most of the candidates had difficulty stating the function of a choke in a fluorescent tube. A choke is used to provide high starting voltage between the filaments to make the lamp slow.

(b) Majority of the candidates drew the wave diagram correctly but failed to indicate ϕ on the diagram.

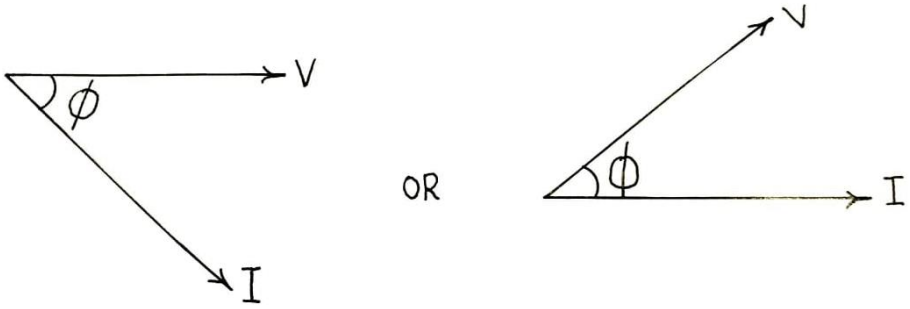
Some candidates also drew the phasor diagram without indicating the ϕ.

(i)



Wave Diagram

(ii)



Phasor Diagram

(c) Only few candidates were able to state the effect of frequency on the current flow in an inductive circuit.
They stated that current flow decreases.

QUESTION 3

(a) Define the following terms:
- (i) current rating;
- (ii) fusing current;
- (iii) fusing factor;

(b) State **two** methods of:
- (i) wiring;
- (ii) earthing;

(a) Majority of the candidates were able to define current rating, fusing current and fusing factor as:

Current rating: This is the maximum current that a load will carry indefinitely without undue deterioration.
Fusing current: This is the maximum current at which the fuse blows.

OR

This is the minimum current at which the fuse element melts
Fusing factor: This is the ratio of the fusing current to the current rating of the fuse.

(b) Majority of the candidates were able to state the methods of wiring and methods of earthing.

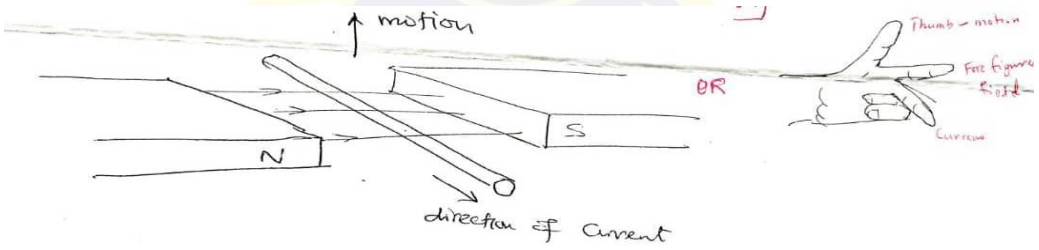
Methods of Wiring: Surface, Conduit, Trunking, Ducting.
Methods of Earthing: Rod, Mesh, Plate, Pipe, Mat.

QUESTION 4

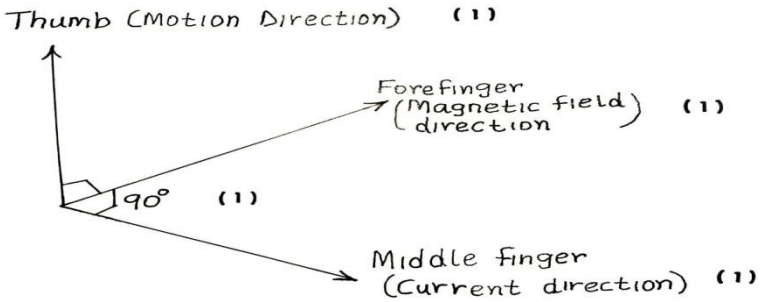
(a) With the aid of a diagram, explain Fleming's Left Hand rule in respect to motors.

(b) A d.c. shunt generator connected across a 30*V* supply has an armature current 20*A* and armature resistance 0.7Ω. Calculate the generated voltage.

(a) Only few candidates could draw the correct diagram to explain Fleming's left hand rule Some of the candidates were also not able to state the representations of the fingers. The correct response is provided below:



OR



When a left hand is held with the thumb, forefinger and middle finger mutually perpendicular, the forefinger points in the direction of a magnetic field, the middle finger points in the direction of the current flowing through a conductor within the field, then the conductor moves in the direction of the thumb.

(b) Some of the candidates who attempted this question were able to calculate the generated voltage as follows:

$V_T = Va - I_A R_A$

$Va = V_T + I_A R_A$

$= 30 + (20*0.7)$

$Va = 44V$

QUESTION 5

(a) Define the term *Integrated Circuit*.
(b) List two types of Integrated Circuits.
(c) State three applications each of the types listed in 5(b).

(a) Majority of the candidates were not able to define integrated circuits.
Integrated circuits are micro-miniature sections of solid state components containing a number of electronic units designed to perform specific electronic functions.

(b) A good number of the candidates could not list types of integrated circuits.
The types of integrated circuits are: Analog and Digital.

(c) Majority of the candidates were not able to state the applications of integrated circuits.

(i) Applications of analog integrated circuits

- Power amplifiers
- Audio/ RF amplifiers
- Voltage regulators
- Operational amplifiers
- Oscillators
- Active filters
- Phase lock loops
- Power management circuit
- Frequency mixing

(ii) Applications of digital integrated circuits

- Logic gates
- Calculator chips
- Micro-processor
- Counters
- Flip-flops
- Mixed *IC*
- Temperature sensor
- Memory chips
- Clock
- Signal decoder and encod

QUESTION 6

(a) Draw a labelled symbol for each of the following Field Effect Transistors (FET):

(i) N - channel;

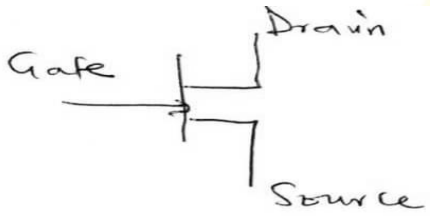
(ii) P - channel.

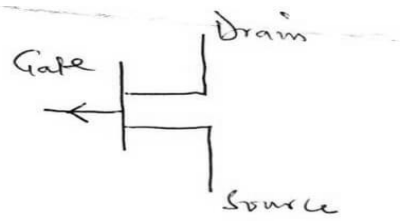
(b) State two:

(i) applications of Field Effect Transistors;

(ii) advantages of Field Effect Transistors over Bipolar Junction Transistors.

(a) Some candidates interchanged the symbol of Field Effect Transistor (FET) N-channel with the P-channel.





N- channel P-channel

(b) Only few candidates were able to state the applications of Field Effect Transistors.

Applications of field effect transistor (FET)
It is used

- as input amplifier in oscilloscopes
- for mixer operation of FM and TV receivers
- as voltage variable resistor in op-amp for large scale integration and computer memories.

(c) A fairly answered question.
The advantages of field effect transistors over bipolar function transistor are:

- High input impedance
- High frequency response
- Hogh power gain
- Small in size
- Long life
- High immunity to radiation
- Low noise
- Easy fabrication
- Longer storage of charges

QUESTION 7

(a) State three characteristics of the common emitter amplifier configuration.

(b) (i) draw an ideal non-inverting operational amplifier.
(ii) state three applications of an ideal operational amplifier

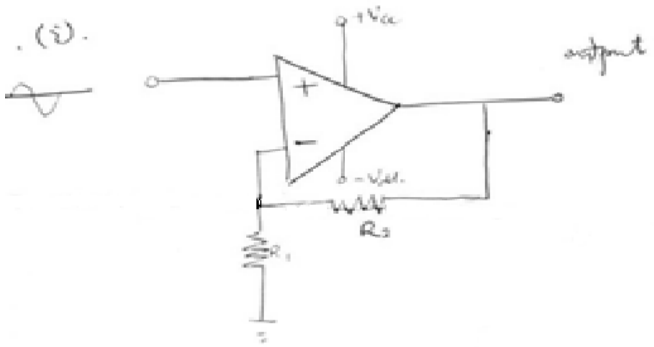
(a) Majority of the candidates were not able to state the characteristics of a common emitter amplifier configuration.

Characteristics of Common Emitter Amplifier Configuration:

- Moderate input impedance
- Moderate output impedance
- High current gain
- Very high voltage gain
- Very high power gain
- Phase reversal

(b) A good number of the candidates answered this question satisfactorily as shown below:

(i)



Ideal non-inverting operational amplifier

(ii) Applications of an ideal operational amplifier

- Summer/adder
- Integrator
- Differentiator
- Amplifier
- Buffer/unity gain
- Subtractor
- comparator

APPLIED ELECTRICITY 3

(a) GENERAL COMMENTS

The standard of the paper was comparable to that of previous year.
Candidates' performance was above average.

(b) SUMMARY OF CANDIDATES' STRENGTHS

(a) Majority of the candidates connected the circuit diagrams correctly.

(b) Most of the candidates selected suitable scales to plot their graphs.

(c) SUMMARY OF CANDIDATES' WEAKNESSES

(a) Some candidates could not determine the gradient of the graph.

(b) Some candidates reproduced the table which amounted to a waste of time.

(c) Some candidates exhibited poor pencil work.

(d) Few of the candidates commented on the graph.

5. Surprisingly, a number of candidates could not multiply a constant (V_2) in Question 2 by a factor.

4. SUGGESTED REMEDIES

(a) Candidates must be taught how to accurately calculate gradients.

(b) Teachers should give more practical lessons to students.

(c) Candidates must learn how to interpret graphs.

(d) Candidates should refrain from reproducing tables to save time.

(e) Candidates must be taught how to do multiplications by a factor.

5. DETAILED COMMENTS

QUESTION 1

Aim: To verify the effect of filtering in power supply units.

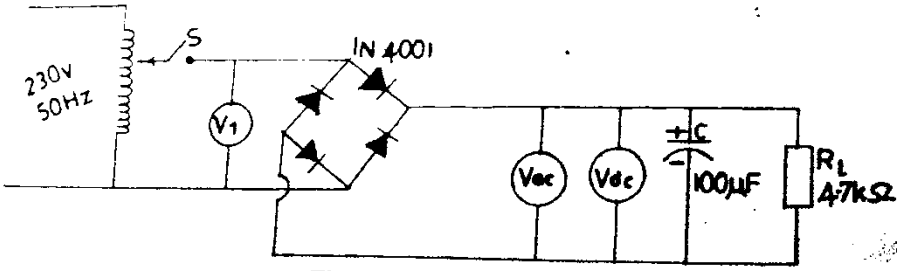


Figure 1.

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

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

(c) You are provided withTable 1.

Table 1

C (μF)	V_1 (V)	V_{ac} (V)	V_{dc} (V)
100	6.0		
220	6.0		
330	6.0		
470	6.0		
1000	6.0		

(d) Set the output voltage, V_1 of the variac to 6 V.

(e) Close switch *S*.

(f) Read and record in Table 1 the values of voltmeters V_{ac} and V_{dc}.

(g) Open switch *S*

(h) Replace the capacitor in the circuit with the capacitor values in Table 1.

(i) Repeat steps (*e*) to (*h*) for the capacitor values in Table 1.

(j) Plot the graph of voltage V_{dc} (V) on the vertical axis against capacitance C (μF) on the horizontal axis.

(k) Determine the slope of the graph.

(l) From the slope, comment on the approximate relationship between the output voltage of the power supply, V_{dc} and capacitance, C.

(m) From your readings, comment on V_{dc} and V_{ac} in relation with the capacitance, C.

Majority of the candidates connected the circuit diagram correctly and plotted good graphs.
A few of the candidates could not determine the slope of the graph.
Some of the candidates wasted time reproducing the tables.

Expected Comments:

(l) The higher the capacitance C, the higher the Vdc

(m) With capacitance C, Vdc increases while Vac decreases

Candidates' performance was average.

QUESTION 2

Aim: To determine the current ratio of a transformer.

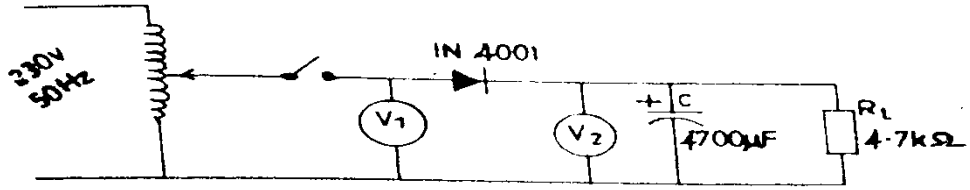


Figure 2

(a) Connect the circuit as shown in Fig. 2.

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

(c) You are provided with Table 2.

Table 2

V_1 (V)	V_x (V) = 1.41 × V_1	V_2 (V)	$I = \frac{V_1}{4700}$ (mA)	$\Delta V = V_x - V_2$ (V)
4				
6				
8				
10				
12				

(d) Set the output voltage, V_1 of the variac to 4 V.
(e) Close the switch *S*.
(f) Read and record in Table 2 the values of voltmeter V_2.
(g) Open switch *S*.
(h) Increase the variac output V_1 in steps of 2V.
(i) Replace steps (e) to (h) for up to 12*V* as shown in Table 2.
(j) Complete Table 2/
(k) Plot the graph of current (ImA) on the vertical axis against change in voltage horizontal axis.
(l) Determine the slope, of the graph.
(m) From the graphy, determine the forward voltage drop, Dv(V) of the diode for a supply voltage of 9V.

Majority of the candidates correctly connected the circuit diagram and followed the experimental procedure.
A few of the candidates had challenge determining the gradient of the graph.
Some of the candidates exhibited poor pencil work.
Candidates' performance was above average.

AUTO MECHANICS 2

1. GENERAL COMMENTS

The standard of the paper compared favourably with that of the previous year. The performance of the candidates was poor compared with that of the previous year.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(a) A large number of the candidates exhibited good knowledge of the sequence of operation of a four - stroke engine e.g. Induction, Compression, Power and Exhaust. They were able to analyze the various stages in the table provided in question number 4.

(b) Most of the candidates provided answers that were legibly written.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(a) Most candidates did rather appalling sketches of the poppet valve and the parallel circuits as if there was nothing at stake.
(b) The inability of candidates to spell common words such as the clutch (croch) and exhaust (exus) is a source of worry. Really there were many spelling mistakes.
(c) It became obvious that most of the candidates had a poor concept of the operation of the four - stoke compression ignition engine.

4. SUGGESTED REMEDIES

To forestall these weaknesses identified above, the following approaches must be adhered to;

(a) The candidates must be more committed in their studies including the Auto Mechanics subject. The candidates must also visit garages to observe the industrial activities.
(b) The candidates must also embark on regularly practising of sketches during their studies.

5. DETAILED COMMENTS

QUESTION 1

(a) (i) Sketch a poppet valve and level two of its parts.

The sketch of the poppet valve must be proportional, clearly showing the land/margin, the face, neck and stem. Most candidates avoided that question and those who attempted did very poor sketches of the valve.

(ii) State two functions of poppet valve in automobile.

Most candidates could not answer this question well. A few wrong responses provided by some candidates were:

- It functions during induction stroke;
- Its function is to provide torque;
- It shows petrol for usage.

Required answers include:

- It allows a fresh charge of mixture or air into the cylinder in induction stroke;
- It allows the escape of exhaust gases during the exhaust stroke;
- It forms a gas-tight seal during the compression and power strokes.

(b) State three functions of the automobile flywheel.

Most candidates' responses were not encouraging. The wrong answers written by the candidates included;

1. It transmits motion from crankshaft to gearbox
2. It is used to turn the propeller shaft
3. The fly wood controls the wheels of the vehicle

The expected answers include:

1. It provides a frictional face for the clutch assembly
2. It provides a ring year to crank the engine
3. It facilitates the smooth rotation of the crankshaft
4. It stores energy during the power stroke and releases it to drive the crankshaft in the idling strokes.

QUESTION 2

(a)

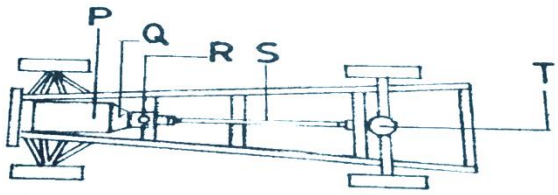


Figure 1.

(i) The components labelled are:
P – Engine/Power unit
Q - Clutch
R - Gear box
S - Propeller shaft
T - Final drive/Rear Axle/Black Axle

It must be noted that the DIFFERENTIAL UNIT is not accepted as an answer to "T".

(ii) State two functions each of the components labelled;

R = Functions of Gear box

Most candidates' responses were wrong. The expected answers include:

1. It enables the vehicle to reverse
2. It provides a neutral position
3. It increases (multiply) torque
4. It varies engine speed due to road conditions

T = Functions of Final drive/Rear Axle

Candidates' responses were not encouraging. The expected responses were:

1. It prevents the engagement of two gears at the same time.
2. It prevents the selected gear from jumping out mesh.

QUESTION 3

(a) The sketch in Figure 2 shows an overhead crankshaft arrangement.

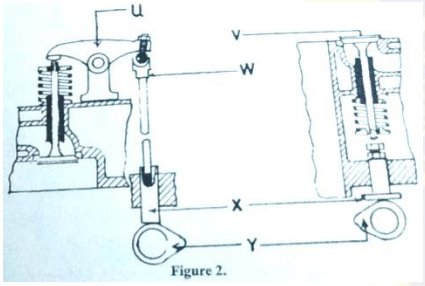


Figure 2.

(i) The expected response for the parts labelled are:

U - Rocker Arm
V - Valve/Valve head
X - Tappet/cam follower
Y – Camshaft

(ii) State three functions of the crankshaft:

Most candidates could not answer the questions well. The functions of the crankshaft include:

1. It converts reciprocating motion of the piston to rotary motion
2. It supports the flywheel
3. It drives the camshaft
4. It indirectly drives the water pump, alternator and the compressor of the air conditioner.

(b) State two purposes of valve clearance.

Candidates could not properly state the purpose of the valve clearance. A few of the incorrect answers provided by the candidates were;

1. Allows fuel into combustion chamber
2. It prevents impurities from entering the system
3. It cleans dirt from the system
4. It allows burnt gases out

The expected answers include:

1. To allow for valve expansion when heated
2. To ensure gas-tightness when closed
3. To prevent loss of compression or loss of power

QUESTION 4

(a) The table below shows the firing order of a complete cycle for a four-cylinder, four-stroke engine.

Cylinder	Firing Order			
	1	3	4	2
1	Power		Induction	
2		Induction		Power
3	Compression			Induction
4	Induction	Compression		

Complete the cells under the firing order with the missing strokes.

(b) Explain the following terms, as applicable to four-stroke compression ignition engine:

(i) induction stroke;

(ii) power stroke.

(c) What is the name of the automobile engine valve that has larger diameter?

(a)
- Exhaust / Compression
- Exhaust / Compression
- Power / Exhaust
- Power / Exhaust

(b) Some of the incorrect answers given by the candidates were;
Most candidates responses were very poor.

It is very important for the candidates to have read the question well to gain good understanding before attempting to provide answers. The question 4(b) clearly was pointing to the compression ignition engine. Only a few candidates had that question right.

The expected responses are:

i. INDUCTION STROKE

In the induction stroke the inlet valve opens and the piston moves from TDC to BDC, creating a partial vacuum which draws air into the cylinder.

ii. POWER STROKE

During the power stroke of the compression ignition engine, both valves are closed and the fresh air charge is compressed resulting to measured temperature and pressure. When the fuel is sprayed at a height pressure combustion is started and a further rise in temperature and pressure forces the piston down on the power stroke.

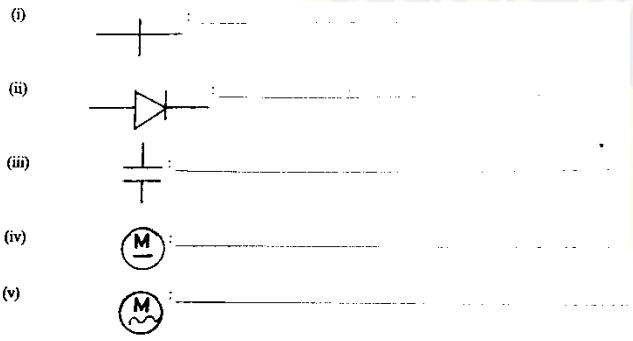
(c) The name of the engine valve with a larger diameter.

Most candidates provided wrong answers. The expected answer is

Inlet Valve...

QUESTION 5

(a) What does each of the following electrical symbols represent?



(b) Sketch a simple parallel electrical circuit consisting of three lamps, a battery and a switch.

(c) State one advantage of parallel circuit connection over series connection.

(d) Explain the term, short circuit.

(a) Electrical symbols:

i. Cross wire / conductors crossing without connecting
ii. Diode / Rectifier
iii. Capacitor / Condenser
iv. Direct current Motors
v. Alternating current Motor

Most of the candidates were bankrupt of the knowledge of electrical symbols.

(b) PARALLEL CIRCUIT

A good number of candidates did very reckless sketches and diagrams of the parallel circuits. The symbol for the battery was also poorly sketched.

(c) ONE ADVANTAGE OF PARALLEL CIRCUITS

Most candidates' responses were incorrect. The required answers include:

- Failure of a lamp will not affect the others in the circuit
- Equal voltage is available to all units
- The load on the battery is reduced
- Defects are easy to tack and rectify

(d) EXPLANATION OF SHORT CIRCUITS

Candidates' responses were not correct. The expected responses include:

- An indication that a portion of the electrical current flows through an unintended path due to poor insulation
- It is an unwanted connection between a conductor and earth due to failure of insulation.

AUTO MECHANICS 3

1. GENERAL COMMENTS

The paper compared favourably with that of the previous year. Candidates' performance was very good.

2. SUMMARY OF CANDIDATES' STRENGTHS

Generally, the candidates made these remarkable gains in the discharge of their tasks:

(a) Most candidates exhibited commendable knowledge and skills in the performance of brake master cylinder service and propeller shaft alignment checks.

(b) Most candidates wore good workshop clothes conducive for the tasks to be performed.

(c) Easy removal and dismantling of the brake master cylinder.

(d) The majority of candidates had neat rags for cleaning their hands.

(e) Checking the straightness and bow of the propeller shaft were easily performed

6. SUMMARY OF CANDIDATES' WEAKNESSES

(a) Only a few candidates had in-depth knowledge of brake bleeding, which is a very vital process in hydraulic brake service

(b) Only a few candidates could identify the check valve in the master cylinder

(c) Most candidates spent too much time in the selection of the appropriate tools e. g. a trial and error process.

7. SUGGESTED REMEDIES

(a) The practical activities in the schools are not enough to provide the candidates the requisite knowledge and skills they may need to enhance a better understanding of the Auto Mechanics subject.

(b) A regular visit to garages and vehicle repair workshops for observation and basic practical work could provide tremendous benefits to the candidates.

(c) The candidates must also work hard enough to link the theoretical lessons with the practical.

8. DETAILED COMMENTS

QUESTION 1

From the vehicle provided:

(a) Remove the brake master cylinder. Report to the Examiner.

(b) Remove the primary and secondary pistons. Report to the Examiner.

(c) Inspect the condition of the rubber seals. Report to the Examiner.

(d) Refit the primary and secondary pistons. Report to the Examiner.

(e) Refit the master cylinder. Report to the Examiner.

(f) Answer two relevant questions from the examiner.

(a) Removal of brake master cylinder

The processes involved in the removal of the brake master cylinder are as follows:

i. Clean the external parts of the master cylinder

ii. Disconnect the brake lines at the master cylinder

iii. Plug the pipes to prevent dirt from entering

iv. Remove the attaching nuts or bolts and remove the master cylinder.

The majority of candidates were able to accomplish the tasks easily and only a few failed to clean the external part of the master cylinder.

(b) Removal of Primary and Secondary Pistons

The necessary steps to remove the primary and secondary pistons in the master cylinder are:

i. Remove the cover and seal of the master cylinder and pour out any brake fluid left

ii. Mount the master cylinder gently in a bench vice

iii. Remove the locking ring, push rod and the primary piston assembly.

iv. Remove the secondary piston, seals, springs and check valve.

The candidates successfully accomplished these tasks.

(c) Inspecting Condition of rubber Seals

i. Clean the master cylinder passages and ports and all the other parts with brake fluid

ii. Dry the parts after cleaning

iii. Inspect the master cylinder for scoring, pitting and corrosion

iv. Inspect the condition of the rubber Seals e. g. getting swollen or weak

the seals are part of the repair kit.

The candidates did the cleaning and inspection successfully

(d) Refitting the primary and secondary pistons

These are the measures taken to refit the piston assemblies into the master cylinder.

i. Coat the inside of the master cylinder with brake fluid and dip all the internal parts in brake fluid.

ii. Refit the secondary piston assembly with the return spring.

iii. Insert the primary piston assembly and lock it into position.

iv. Refit the push rod in the primary piston and lock it in its position

The various tasks were handled successfully by majority of the candidates.

(e) Refitting of Master Cylinder

i. Mount the master cylinder in its position and attach the securing nuts /bolts

ii. Connect the brake pipes

iii. Fill the master cylinder with brake fluid to the correct level.

iv. Attach bleeding tubes and bleed the brakes

(f) Examiner's Questions

These were sampled questions posed by the examiner

i. What is the effect of air in the braking system?

ANS: It makes the braking system spongy in action.

ii. What is the purpose of the by-pass port in the master cylinder?

ANS: It prevents binding brakes or self application of the brake when the brake fluid expands by allowing it access to the reservoir.

Most candidates answered the question 1 successfully but fumbled with question 2.

QUESTION 2

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

(a) Place vee-blocks on the surface plate. Report to the Examiner.

(b) Set the propeller shaft on the vee-blocks. Report to the Examiner.

(c) Check the propeller shaft for straightness. Report to the Examiner.

(d) Check the propeller shaft for bow. Report to examiner.

(e) Check the propeller shaft splines for wear, oiliness and breakage. Report to the Examiner.

(f) Answer two relevant questions from the Examiner.

(a) Placing Vee-blocks on surface plate

i. Slightly oil the surface plate and wipe it clean

ii. Position two vee-blocks on the surface plate to receive the propeller shaft

The candidates had no difficulty in handling these tasks.

(b) Setting Propeller shaft on vee-blocks

i. Mount the propeller shaft at the two ends on the vee-blocks

The candidates easily performed the task

(c) Checking straightness of propeller shaft

i. Place a dial gauge on the surface plate with its pointer touching the propeller shaft.

ii. Move the dial indicator lengthwise along the propeller shaft.

iii. Turn the propeller shaft through 90° and repeat the lengthwise movement along it.

Any variation in the reading indicates the propeller shaft has run-out of straightness.

(d) Checking the propeller shaft for bow

i. Mount the dial gauge close to one end of the propeller shaft and rotate it to observe the reading

ii. Repeat this check at the centre of the shaft and close to the other end.

Any sharp differences in reading at the three points indicate the shaft has bowed.

The candidates successfully carried out these tasks.

(e) Checking condition of propeller shaft splines

This check is carried out by visual inspection

i. Visually inspect the propeller shaft splines for wear, oiliness and breakage.

Though the visual inspection seemed easy some candidates couldn't assess the actual conditions of the propeller shaft splines.

(f) Examiner's Questions

These were sampled questions posed by the examiner:

i. State the purpose of the splines at the forward end of the propeller shaft

ANS: It is to allow the propeller shaft to vary its length as it rises and falls

ii. Through which means is the propeller shaft connected to the gearbox and final drive

ANS: The use of universal joints.

The candidates successfully responded to the two questions.

BUILDING CONSTRUCTION 2

1. **GENERAL COMMENTS:**

The standard of the paper was very good.
The paper gave equal opportunity to both brilliant and weak candidates.
Performance of candidates was very fair looking at the answers produced by most of them.
However, good performance was recorded by some candidates. On the whole, performance of candidates was little above average.

2. **SUMMARY OF CANDIDATES STRENGTHS**:

a. Reasonable and convincing answers were given by some candidates.
b. They were able to arrange their responses in an orderly manner.
c. Some in their own initiative produced good answers which were in line with the scheme.

3. **SUMMARY OF CANDIDATES WEAKNESSES**

a. In the area of sketch, candidates did not perform very well. It was clear that they lacked the skill in sketching.
b. Questions involving sketches were a challenge to many candidates even though, the sketches requested were very simple and basic.
c. Candidates did not consider the proportionality of the objects they were to sketch.
d. Parts or elements on the sketches were wrongly placed and labelled.
e. Expressions associated with English was a difficult task many candidates. It was clear that some candidates did not complete the syllabus.

4. **SUGGESTED REMEDIES:**

a. Effort should be made by teachers to complete the syllabus. The idea of candidates learning from past questions instead of being taught in the classroom must be given serious attention.
b. Future candidates must take subject serious and devote time for its preparation.
c. They must learn to interpret technical and building drawings to be able to produce good sketches.
d. Teachers must use the correct technologies in their teaching rather than the unnecessary jargons. Theory lessons must have bearing on the practical lessons.

5. **DETAILED COMMENTS.**

Question 1
(a) State three ways by which excavated spoils are disposed off on a building site.

Stating three ways by which excavated spoils are disposed off on a building site, simply means how the excavated soil or material is reused on the building site.

Excavated spoils can be used to:

- Backfill the trench
- Spread out on the site for landscaping
- It could also be stored in heaps at a convenient area on the site for future use.

Instead of the above, candidates talked about methods of safeguarding the slides of a trench from caving in. Some also stated equipment or tools and how they are used for excavating.

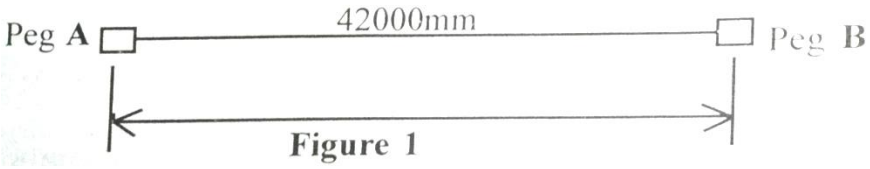


Figure 1

(b) (i) Use Figure 1 to explain how the right-angled corner at B can be established using 3: 4: 5 method.

The question looked for how the 3:4:5 method is used in setting out could be applied with a given distance.

Performance of candidates' was far from what was required by the question. For example, if length AB was 4200mm based on 3 units then AB what would be the lengths for BC and AC which were 4 units and 5units respectively.

(ii) Sketch the isometric view of a corner profile.

Isometric view of a corner profile is a basic topic in a setting out operation. However, candidates found it difficult to provide reliable answers. Some sketches had one peg with a thin line as the profile board.

(c) State the specific use of the respirator on a construction site.

The use of a respirator on a construction site is to protect the worker from inhaling dust, fumes and other substances that affect the lungs.

Question 2

(a) State three desirable qualities of a wet concrete.

The question was attempted by most candidates. The answers given were for hardened concrete and not wet concrete.

Wet concrete simply means fresh concrete or a concrete which not is set. Good answers were given by some few candidates.

Concrete in its wet state must possess some qualities to keep it for use within a given time.

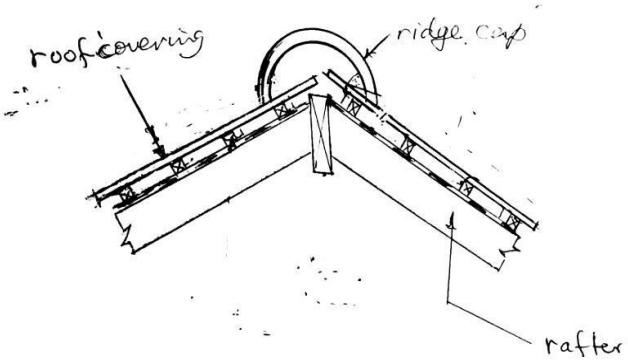
(b) Sketch the ridge detail of a double pitched roof and indicate the following parts:

i. **Ridge cap**
ii. **Rafter**
iii. **Roof covering**

The question requested for the detail of a double pitched roof with some given parts to be labelled.

Candidates attempted the question, but most sketches produced did not represent a roof.

Equally good sketches were produced but the items to be labelled were wrongly identified.
The required sketch is shown below:



(c) State one functional requirement of an external door.

The question was well answered by most candidates.
The question was answered correctly by most candidates.

Question 3

(a) List the six stages involved in testing a newly laid drain using the water test method.

In drainage every newly laid drain must be tested to find out whether the joints are tight to avoid leakages like obnoxious gases, foul air from waste water to people's health.

With the water test method, the lower end of the chain is blocked and the upper end of the chain is blocked and the upper end is fixed with a cistern filled with water.
The process is left for two hours and then a check is made on the cistern to find out whether the water level in it has dropped.

If it has dropped, the cistern is again topped up with water and left for one hour. The cistern is checked again. Where there is a drop in the cistern the pipe line must be checked for leakages for it to be corrected.

The answers provided by candidates indicated that they had never performed the test before.

(b) State three reasons for providing a ceiling in a roof construction.

Good answers were given by most candidates. However, candidates gave two answers at most out of the requested three.

(c) List three methods of finishing an external surface of a sandcrete block wall.

Methods for finishing an external sandcrete block wall include:

- Cement – sand render
- Painting
- Tiling
- Tyrolean finish
- Pebble dash/spatter dash
- Terrazzo finish.

Some of these methods are openly displayed on buildings, yet candidates mentioned finishes like;

- Paper lining
- Plastering Paris.
- Plywood panels.

Question 4

(a) State three advantages of sandcrete brick fence wall over unburnt clay block fence wall.

The question was clear on the answers expected. Sandcrete brick by composition makes it stronger, more durable, and water/moisture resistant than unburnt clay block.

Candidates could not do proper comparison of the two building materials for them to supply good answers. The expected answers are:

- It is more durable
- It is stronger
- It can withstand weather elements
- It is not easily attacked by termites

(b) State three factors that would influence the selection of a type of gate for a school fence wall.

Comprehending the question was a major challenge to many candidates. Gates are common all over, and why would one choose a type of gate for a school fence wall.

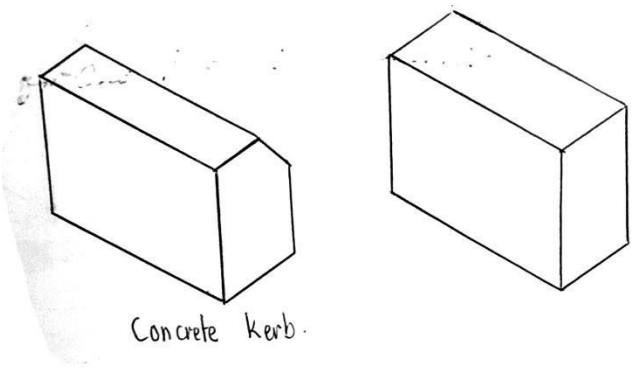
The reasons are that;

- The ease at which the material for the gate can be obtained.
- The cost of the material,
- How long would the material last,
- The strength of the material as compared to others,
- Whether it can be attacked by termites,
- Whether it can withstand weather elements.

A good number of candidates gave good and partial answers which were reasonable.

(c) Sketch a concrete block used for the construction of a road kerb.

The candidates were asked to sketch a concrete kerb. A concrete kerb is used to demarcate vehicular carriageway and pedestrian walk way. Even though candidates produced some sketches most of them were not in the shape of a concrete kerb.
The required sketch is shown below:



Question 5

(a) State three factors to be considered before excavating a foundation trench.

Stating three factors to be considered before excavating a foundation trench was misunderstood by candidates. Some responses from candidates:

- Bearing capacity of the soil,
- Size of building,
- Contour of the land.

Before excavating a foundation trench, the following factors should be considered:

- Safety of workmen when working in the trench,
- Type of excavation machine or tools that would be appropriate for the work,
- Duration for which they shall remain opened,
- Method of preventing the trench side from caving in,
- Method of keeping the trench free from ground water.

Inspite of the misunderstanding, some candidates gave good answers to the question.

(b) Explain each of the following activities in relation to site operation:

(i) Site clearing;

(ii) Site levelling;

Explanations for the following activities in relation to site operation were fairly answered.
In the case of site cleaning the responses were very good but that of site clearing were not clear. Some thought that building on level ground or removing the vegetative soil were activities of site clearing.

(c) State two construction requirements of a steel reinforcing bar placed in a wide-strip foundation.

Construction requirement of steel reinforcing bar placed in a wide-strip foundation is a different question from its qualities.
With the requirements, we look at how;

- The steel bar will resist tensile stresses,
- The steel bar will strengthen the concrete foundation.
- To prevent failure to the foundation concrete.

BUILDING CONSTRUCTION 3

1. GENERAL COMMENTS:

The paper compares favourably in context and content with those of previous years.

Contents of the specification have been well touched on.

Candidates' general performance was average.

2. SUMMARY OF CANDIDATES STRENGTHS:

Majority of the candidates were able to attempt and write massively and constructively on the four questions demanded by the specifications.

Candidates numbered their worked examples well. Handwritings were legible and arrangements of worked examples were well presented; thereby making the marking of the scripts easy.

3. SUMMARY OF CANDIDATES WEAKNESSES

(1) Majority of the candidates seem to be deficient in understanding some of the phrases and action verbs that should enable them to answer the questions satisfactorily;

i. Functions
ii. Functional requirements
iii. Uses of
iv. Factors for considering
v. Reasons for

Therefore, answers provided for questions 1 aii, 2b, 3a, and 6c were somehow poor.

(2) The flow in sentence construction and spelling of words needs further attention from candidates. It is really hurting for candidates to spell wrongly words which appear in the very question posed.

(3) Most of the candidates failed to apply sectioning symbols to the walls, concrete floor slabs, cement sand screeds and the ground levels.

4. SUGGESTED REMEDIES:

i. The word phrases and action verbs used to frame the questions should be highlighted by teachers if possible for students' attention before they write their final examination.

ii. Candidates and for that matter, students should be encouraged to read more to broaden their scope in the subject area and their chosen trades.

iii. Reading more will enable them to overcome the common spelling mistakes occurring every now and then and as well help them construct good and understandable sentences.

5. DETAILED COMMENTS.

Question 1

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

(ii) State two functional requirements of element A.

(b) (i) In five steps describe how the concrete floor slab is placed on the hardcore filling with ready mixed concrete.

(ii) List seven tools used to perform the task in (b)(i).

(c) Sketch a detailed section through the wide strip foundation and label the following parts:

(i) Foundation concrete;
(ii) Steel reinforcement;
(iii) Substructural wall
(iv) Finished ground level;
(v) Hardcore filling;
(vi) Concrete slab;
(vii) Cement sand screed

Question 1

(a) (i) Identification of elements.

Elements A and B were not identified as required by almost all who attempted these questions and thereby scored half the requisite mark.

Element B for example should read 'external brickwall' for an answer but majority of the answers given was; 'Wall'.

This answer does not specify the type and position of the wall in question

Elements C and D were fairly answered.

(a) (ii) Functional requirement of element A.

The phrase functional requirement threw many at the candidates out of tune. Most of the answers given were below standard. Many expressed themselves thus element A "must be strong" instead of writing, element A "carries or distributes loads from the walls to the ground" as a specimen answer.

(b) (i) Placing concrete slab on hardcore fill.

Though the question was silent about sequencing, many of the answers given missed the flow needed to give a good answer.

ii. From the scripts sampled, no candidate mentioned pegging to determine the thickness of the concrete slab and daubing around the pegs.

iii. The question indicated ready mix concrete but some candidates went ahead to mix concrete thereby exhausting the five steps without giving a requisite answer.

(ii) Listing of the hand tools was well done.

(c) (i) Most of the sketches were good and elaborate, others were however oversized.

(ii) Many did not show the sectioning symbols to the element and components as desired by the question.

(iii) The steel reinforcement in the Wide Strip foundation was not accompanied with a blinding layer in almost all candidates' sketches. A very key short fall.

Question 2

a. State the use of each of the following tools and materials when setting out a building :

i. Pegs;
ii. Club hammer;
iii. Builder's square;
iv. Tape measure;
v. Line and pin.

b. State two functions of a concrete ground floor slab.

c. State three reasons for providing hardcore filling under a ground floor slab.

(a) Uses of the hand tools.

Question was well answered. A few however gave answers which did not reflect the operation involved.

(b) Functions of concrete floor slab were well attempted with good answers.

(c) Some good reasons were given. Many also faulted by given poor summarized phrases such as;
   i. Comfort
   ii. Durability

It is better candidates framed their solutions in sentences in this context to expatiate the reasons as the question demanded.

Question 3

a. State three functional requirements of each of the following wall:
   i. External wall;
   ii. Internal partition wall.

b. List four types of working drawings used for the construction of a new building.

c. State two advantages of a thatched roof covering over an asbestos roof covering.

(a) The attempt on the question was good. However, in answering, majority replaced the functional requirement with explanation of the elements. By this, there was slight deviation of the specific solution required. The responses expected include:

- It must resist moisture penetration
- It must be strong to resist being crushed by floor loads
- It must be strong to resist wind pressures
- It must be durable to last
- It must be able to keep out rain

(b) The question was well answered.

(c) The question was poorly answered.

Candidates could not express themselves with responses such as 'good control at noise'; free from chemical emission and so on. The need to call for more reading on the topic should receive attention from the students.

Question 4

a. State three benefits of a floor screed.

b. Explain each of the following:
   i. Waste drainage;
   ii. Public sewer.

c. State two functions of each of the following building regulatory personnel:

i. Building inspector;

ii. Town planner.

(a) The question least attempted.

Most candidates who attempted indicated no knowledge of the benefits of the floor screed. Most of the answers delivered were directed towards the uses at the concrete floor slab, thereby deviating slightly.

(b) Explanations given to the waste drainage and public sewer were very poor.

The expected response includes:

It includes pipe works that takes the discharge of effluent from the waste fitting such as W.C to the treatment facility.

(c) The task performed by town planner in the building industry needs to be well explained to the students. The question was poorly answered. The expected responses include:

They are large pipes which receive waste from building plots to the public treatment plant/facility.

Question 5

a. State one use of each of the following types of cement:

i. Ordinary Portland cement;

ii. Sulphate resisting Portland cement;

iii. White cement.

b. State three safety measures to be adopted on a site to prevent accidents.

c. State four functional requirements of a scaffold for use on a construction site.

(a) The use of cement types was answered well.

(b) As the question was silent on the type of measures required most of the candidates' answers centred on safety clothing.

The essential technical elements such as;

i. Tidying up the site

ii. Complying to warning signs and safety regulations etc.

were scarcely recalled by candidates.

(c) Most candidates' responses replaced the demands of functional requirement with precaution measures and or uses of the scaffold.

Examples of weak responses by most candidates have been;

i. Should prevent persons from falling

ii. Should prevent tools from falling and

iii. Should help workers to work on different angles instead of; the required answers include:

a. The scaffold must be strong to support loads placed on it etc.

b. Understanding the phrase functional requirement as used in posing the question should be given some attention by the students.

Question 6

a. List six parts of a suspected timber ground floor construction

b. State functional requirements of a staircase.

c. Describe each of the following types of window:

i. Casement window

ii. Sliding window.

(a) The parts of the suspended timber ground floor were well listed.

(b) Most responses from the candidates centred on the precautions and use of the stair leaving out the key and technical aspects such as:

i. Promoting comfort

ii. Adding beauty to the structure etc.

Candidates need to know the expectations of functional requirements.

(c) Answers given on the description of the casement and sliding windows by those who attempted the question was good.

A few rather sketched with much elaboration to reveal the differences.

ELECTRONICS 2

1. GENERAL COMMENTS

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

The overall performance compared with that of the previous year was generally poor.

2. A SUMMARY OF CANDIDATES' STRENGTHS

(c) Majority of the candidates had a fair knowledge of electronic components that feature in integrated circuits (IC).

(d) Majority of the candidates were able to recall the advantages of ICs over discrete components.

(e) Most of the candidates had a fair idea of appliances that utilize thermostatic sensing.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(d) Majority of the candidates did not demonstrate knowledge and understanding of electronics.
(e) Majority of the candidates could not answer the questions satisfactorily.
(f) Most of the candidates did not prepare adequately for the exams.

4. SUGGESTED REMEDIES

(c) Candidates should read widely on electronics text books to broaden their knowledge in the subject.
(d) Candidates should be taught the techniques of answering questions.
(e) Some recommended Electronic text books should be made available to students. Examples are;
  (i) Semiconductor theory by Parker and Parker;
  (ii) Exploring Electronics by Boss W, Electronics made easy by F. Fllyord.
(4) Heads of Institutions must ensure adequate coverage of the syllabus before the examination.

5. DETAILED COMMENTS

QUESTION 1

(a) Define the following:
i. Mutual inductance;
ii. Self inductance.

(b) Figure 1 is an inductive circuit:

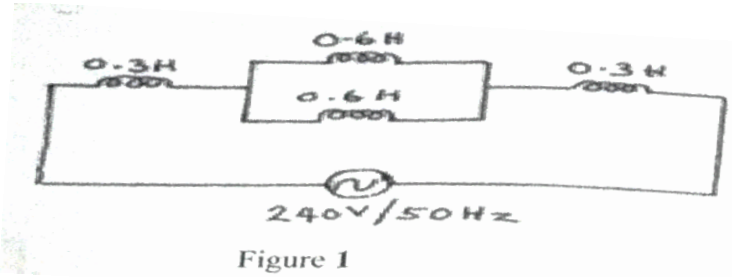


Figure 1

Calculate the:

i. **effective inductance;**
ii. **inductive reactance of the circuit.**

(a) Candidates' response to the question was very poor. Majority of the candidates could not define mutual inductance and self inductance.

(b) Some candidates found it difficult calculating for the effective inductance. However, majority of the candidates were able to calculate for the inductive reactance of the circuit.

The expected response is given below:

(a) i. *Mutual Inductance* may be defined as that property of inductors through which emf is induced in one coil as a result of changes in the flux linkage due to changes in current in an adjacent coil. It is a measure of the ability of a coil to oppose changes in current in an adjacent coil.

ii. *Self-inductance* may be defined as that property of the coil that determines the emf induced in the coil when magnetic flux linking with it changes with time.

b) i. The equivalent inductance of the 0.6H inductors connected in parallel is

$$\frac{0.6\times 0.6}{0.6+0.6}H = 0.3H$$

Therefore the equivalent inductance of all 4 inductors is

$$(0.3+0.3+0.3)H = 0.9H$$

ii. The circuit's effective inductive reactance is

$$X_L = 2\pi f L_{eff} = 2\times\pi\times 50\times 0.9\Omega = 282.743\Omega$$

QUESTION 2

(a) Define the following quantities with respect to sinusoidal waveforms:

i. Average value;

ii. Root mean square (r.m.s) value;

iii. Peak-to-peak value.

(b) The maximum value of a sinusoidal voltage is 230 V. Calculate its:

i. Root mean square (r.m.s) value;

ii. Average value.

(a) Majority of the candidates could not define the terms correctly. Candidates' performance was poor.

(a) i. For the sinusoid, **average value** is defined as the average, taken over one half of the waveform's period. It is given, in terms of its peak value, by $v_{rms} = \frac{2}{\pi} v_{peak} = 0.637 v_{peak}$. It is the reading of the '*rectifier-type'* reading instrument.

ii. A sinusoid's rms (**or *effective)* value** is that value of dc current or voltage, which has these same heating effects as the ac voltage or current. It is given by $v_{rms} = \frac{v_{peak}}{\sqrt{2}}$. It is the reading of the '*hot-wire* 'type reading instrument

iii. The **peak-to-peak value** of a sinusoid is the difference of its positive maximum and the magnitude of its negative maximum. It is twice the maximum or peak value. $V_{pp} = 2V_{\max}$

(b) Some candidates calculated the R.M.S. value and average values correctly whiles others also failed in that regard.

The correct response is:

(b) i. $v_{rms} = \frac{230}{\sqrt{2}} V = 162.635V$ **OR** v_{rms} = 0.707 x 230 = 162.61V

ii. $v_{av} = \frac{2 \times 230}{\pi} = 146.423V$ **OR** v_{av} = 0.637 x 230 = 146.51V

QUESTION 3

(a) State:

i. three electronic components that can be fabricated to form an integrated circuit;

ii. four advantages of integrated circuits over combined discrete circuits.

(b) Draw the circuit of an *npn* transistor in common emitter configuration.

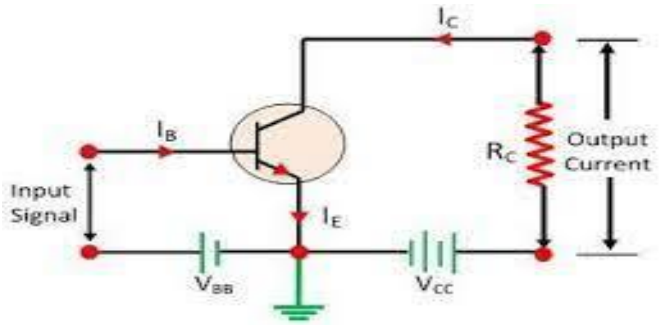
(c) List two factors that influence the magnitude of induced e.m.f in a coil.

(a) Majority of the candidates answered this question satisfactorily. The performance was generally good. Some of the responses provided were:

Electronic components that feature in Integrated Circuits include *capacitors, inductors, resistors, diodes, transistors, relays and quartz crystals.*

Advantages of ICs include *Smaller size, Lower power consumption, Faster operating speed, Better reliability, Lighter weight and Ease of replacement*

(b) Majority of the candidates could not draw the circuit diagram of an NPN transistor in common emitter configuration. The correct circuit diagram is shown below:



QUESTION 4

(a) Define the term *electromagnetic induction*.
(b) List two factors that influence the magnitude of induced e.m.f in a coil.
(c) The current in a coil changes from 4 A to 1 A in 0.4 seconds. If the induced e.m.f. is 50 V, calculate the:
  i. Inductance of the coil;
  ii. Energy stored in the coil.

(a) Majority of the candidates could not define the term electromagnetic induction correctly.

Electromagnetic induction may be defined as the induction of voltage in a coil, due to the change with time, of the magnetic flux linking with the coil.

(b) A poorly answered question.

The magnitude of emf induced in the coil depends on:
- *time rate of change of current through the coil;*
- *inductance of the coil*er *number of turns of coil*
- *time rate of change of flux linkage*
- *flux density*
- *length of coil*
- *velocity of the conductor.*

(c) Majority of the candidates could not calculate the inductance of the coil and the energy stored in the coil.

Overall, candidates' performance in this question was very poor.

An appropriate response to the question is given as:

i. $e = -L\frac{(I_2 - I_1)}{t}$

$50 = -L\ \frac{(1-4)}{0.4}$

$0.4(50) = 3L$

$\frac{20}{3} = L$

Inductance, L = 6.67H

ii. There are three possible answers to this question, as posed:

Initial energy stored in coil = $\frac{1}{2}\times\frac{20}{3}\times 1^2 = \frac{10}{3}J$

Final energy stored in the coil = $\frac{1}{2}\times\frac{20}{3}\times 4^2 = \frac{160}{3}J$, and

Change in energy stored in the coil, which is

$$\frac{1}{2}L\left(i_2^2 - i_1^2\right) = \frac{1}{2}\times\frac{20}{3}\times(16-1) = \frac{160}{3} - \frac{10}{3} = 50J$$

QUESTION 5

(a) Define the following amplifier types with respect to input-output cycle relationship:

i. Class A;

ii. Class B.

(b) Figure 2 is the frequency response curve of a transistor amplifier with a bandwidth of 90 kHz.

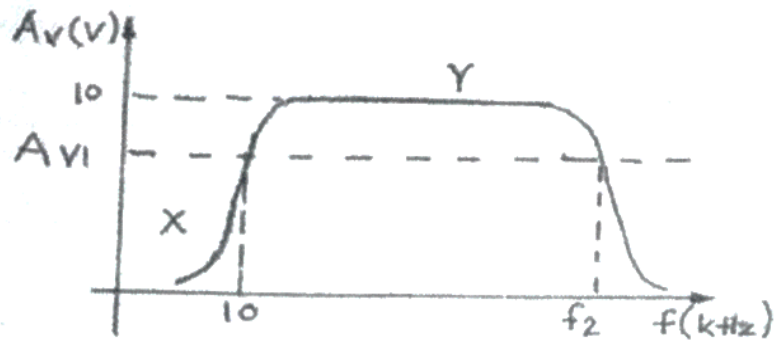


Figure 2

Calculate the:

i. **Half power gain (A_{vi});**
ii. **Upper cut-off frequency (f_2);**
iii. **Identify the regions labelled X and Y.**

An unpopular question.

The few candidates that attempted the question failed to provide correct responses.

Candidates' performance was extremely poor.

The correct response to the question is given below:

a) In terms of the *input-output cycles'* relationship

i. a '***Class A***' amplifier is one, for which there is an output for the entire cycle of the input signal

ii. and the '***Class B***' is one for which there is an output only for half the input cycle.

(b) i. **Voltage gain at the '**half-power' point is determined as

$$A_{v1} = \frac{A_v}{2} = \frac{10}{2} = 5$$

NOTE: 'Gain' by definition, is a dimensionless quantity; and may refer to voltage, current, or power gain. For amplifiers, frequency response is typically with reference to 'power gain', so that at the half-power points, gain is given by $A_{hp} = \frac{A_{mid}}{\sqrt{2}}$ *, which in this case, would be 7.071*

ii. The upper cut-off frequency is given by $f_2 = BW + 10 = 90 + 10 = 100\,kHz$

iii. The region labelled 'X' is the *'low frequency region'* of the response, and that labelled 'Y', the '*mid-frequency region'* of the response.

QUESTION 6

(a) Describe the function of the following devices in communication systems:
- **i. Antenna**
- **ii. Microphone**
- **iii. Local oscillator**

(b) An a.m. radio station broadcast on a frequency of 5 MHz If the modulating signal frequency is 20 kHz, calculate;
- **i. Lower sideband;**
- **ii. Upper sideband.**

(c) State two applications of an oscillator.

(a) Majority of the candidates could not describe the function of the antenna, microphone and local oscillator in communication systems.

Candidates' performance was poor.

In generic wireless communication system (including voice communication),

i. the *antenna* at the *transmitting end*, radiates electromagnetic energy into space, and at the *receiving end, captures and delivers electromagnetic energy to the receiver.*

ii. the *microphone,* at the transmitter, *converts voice into an electronic signal* that serves as the modulating signal.

iii. the *local oscillator* at the receiver, provides *a carrier signal at the same frequency as the carrier at the transmitter.*

b) With $f_c = 5MHz$, and $f_m = 20kHz = 0.02MHz$,

i. $f_{lsb} = f_c - f_m$ = (5 - 0.02) MHz = 4.98 MHz

ii. $f_{usb} = f_c + f_m$ = (5 + 0.02) MHz = 5.02 MHz

(c) Candidates, response to the question was fair. Some of the candidates were able to calculate both the lower and upper sideband frequencies correctly.

The adequate response to the question is:

$f_c = 5MHz$, and $f_m = 20kHz = 0.02MHz$,

i. $f_{lsb} = f_c - f_m$ = (5 - 0.02) MHz = 4.98 MHz

ii. $f_{usb} = f_c + f_m$ = (5 + 0.02) MHz = 5.02 MHz

QUESTION 7

(a) Explain the term servomechanism.

(b) State three physical quantities that are controlled by closed loop systems.

(c) State three appliances that use thermostatic sensing control

(d) State two effects of negative feedback in a closed loop control system.

(a) Majority of the candidates could not explain the term servomechanism.

A *servomechanism* is basically a negative feedback control device, which automatically controls a large output (physical quantity -usually position or speed) using a much smaller corresponding input signal.

(b) A poorly answered question.

Physical quantities controlled by closed loop systems include position, speed, fluid level (or volume), temperature (or heat), light intensity and pressure.

(c) Some of the candidates were able to state three appliances that use thermostatic sensing control. Candidates' performance was fair.

Some of the correct answers they provided include: Electric iron, Air conditioner, Refrigerator (or deep freezer), Water heater, Oven, Boiler and Hot plate burner.

(d) Majority of the candidates could not state two effects of negative feedback in a closed loop control system. The overall performance of the candidates was poor.

The effects of negative feedback include:

Reduced gain, Increased bandwidth, Reduced noise or distortion, Improved stability and Improved input/output impedance.

ELECTRONICS 3

1. GENERAL COMMENTS

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

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

2. A SUMMARY OF CANDIDATES' STRENGTHS

(1) Majority of the candidates were able to perform both experiments appropriately.

(2) Candidates were able to use their readings to plot the graph according to the scales.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

(1) Some of the candidates provided irrelevant information by redrawing the circuit diagrams from the question before answering them. This was not demanded by the rubrics.

(2) Some of the candidates reversed the axis of the graph by plotting V_{in} on the vertical axis and V_{out} on the horizontal axis.

(3) Some of the candidates seemed to have problem with the measuring instruments.

4. SUGGESTED REMEDIES

(1) Candidates should read instructions provided in the question and follow it strictly.

(2) Candidates should be provided with sufficient instruments if possible during practical activities in school.

(3) Candidates should be encouraged to perform more activities on instrument reading and recording.

5. DETAILED COMMENTS

Candidates were provided with the following apparatus:

One regulated d.c. power supply unit (0-15 V)

One BC 107 npn transistor or its equivalent;

One multimeter;

Two 1 kΩ, $^{1}/_{2}$ W resistors;

One BZY 6.2 V zener diode or its equivalent;

One toggle switch (S);

One breadboard/Veroboard;

One soldering iron with resin-cored solder;

Connecting wires;

A pair of pliers.

QUESTION 1

AIM: The diagram of both experiments is to investigate the function of zener diode in a transistor series voltage regulator.

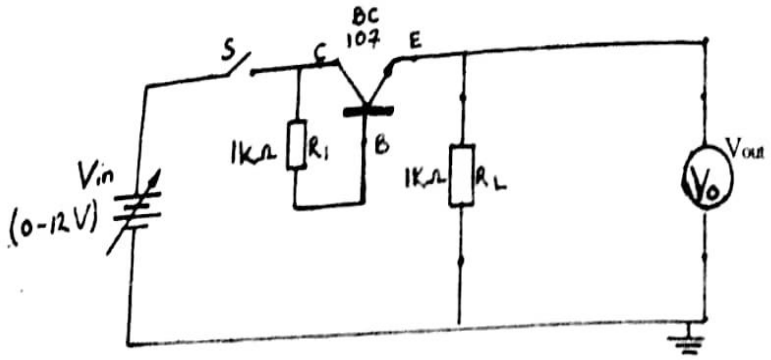


Fig. 1

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

Table 1

V_{in} (V)	V_{out} (V)
2	
4	
6	
8	
10	
12	

(d) Set the power supply unit to 2 V.
(e) Close switch (S).
(f) Read and record in Table 1, the values of V_{out}.
(g) Open switch (S).
(h) Repeat steps (*d*) to (*g*) for the other values of V_{in} in Table 1.
(i) Plot a graph of V_{out} (V) on the vertical axis against V_{in} (V) on the horizontal axis.

The question required the candidates to connect a circuit of a series transistor as a voltage regulator without zener diode.

Candidates were to perform the experiment and complete the table per their results.

Majority of the candidates were able to complete the table and answer the relevant question using their results.

However, some of the candidates reversed the axis of the graph by plotting V_{in} on the vertical axis and V_{out} on the horizontal axis

Candidates' performance was good.

QUESTION 2

AIM: To determine the zener action on a given load.

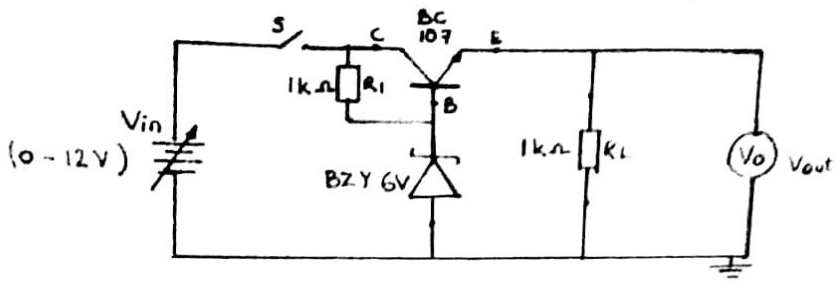


Fig. 2

(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 1

V_{in}	V_{out}
2	
4	
6	
8	
10	
12	

(d) Set the power supply unit to 2 V.
(e) Close switch (S).
(f) Read and record in Table 2, the value of V_{out} (V).
(g) Open switch (S).
(h) Repeat steps (d) to (g) for the other values of V_{in} in Table 2.
(i) On the same graph sheet used in Question 1, plot a graph of V_{out} (V) on the vertical and V_{in} (V) on the horizontal axis using Table 2.
(j) From your graph;
  a. Determine the zener voltage of the zener diode;
  b. State the effect of the zener diode on the output of the circuit.

The question required the candidates to connect a circuit of a series transistor and zener diode as voltage regulator.
Candidates were to perform the experiment and complete the table and answer the relevant questions.
Majority of the candidates were able to complete the table and answer the relevant questions using their results.
Good graphs were drawn by the candidates. Few of the candidates reversed the axis of the graph by plotting V_{in} on the vertical axis and V_{out} on the horizontal axis
Candidates' performance was generally fair.

INFORMATION AND COMMUNICATIONS TECHNOLOGY (ELECTIVE) 2

1. **GENERAL COMMENTS**

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

The paper was based on the contents of the syllabus and the general performance was average.

2. **SUMMARY OF CANDIDATES' STRENGTHS**

(1) In general, candidates answered the questions as demanded by the rubrics.

(2) A fairly good number of candidates exhibited good knowledge of the subject matter.

(3) A greater number of candidates expressed themselves much better in the English language than had been the practice in previous years.

(4) Only a few candidates answered more than three questions, unlike the situations in previous examinations.

(5) Candidates exhibited good knowledge in computer files and computer crime.

3. **SUMMARY OF CANDIDATES' WEAKNESSES**

The following were the main candidates' weaknesses identified:

(1) Inability to appreciate the key requirements of the questions.

(2) Little or no evidence that candidates planned answers before writing them down.

(3) Some of the candidates had bad handwriting.

(4) Some candidates demonstrated in their answers that they had little or no knowledge of the examination syllabus.

(5) Question 4 which was on desktop publishing is the least popular question, followed by question 5 (programming).

4. **SUGGESTED REMEDIES**

(1) Candidates should carefully read through the questions, selecting those to be attempted and planning the answers before writing them out.

(2) Candidates should learn with suitable textbooks on ICT and carefully use the Internet as a learning tool.

(3) Candidates should avoid the use of inappropriate standards of communication such as those they often use on the various social media platforms.

(4) Teachers of the ICT Elective subject should learn to adhere to the syllabus as much as possible and refrain from teaching just anything they see in their textbooks since it has been discovered that some of the textbook materials are incorrect/inappropriate.

5. DETAILED COMMENTS (QUESTION BY QUESTION)

QUESTION 1

(a) Explain the following terms:

(i) Computer file;

(ii) Computer file attributes.

(b) List *four computer file* attributes.

Performance was generally good on this question. Candidates realized that a file needs to be stored on an appropriate storage medium.

The following is the solution:

(a) (i) A computer file is a computer resource for recording data on a computer storage medium. It may be designed to store image, written message, video, program, etc.

Or

A computer file is a resource for storing information which is available to a computer program and is usually based on some kind of durable storage. It has a name called file name.

(ii) Computer file attributes are types of meta-data that describe and may modify how files or directories in a file system behave. They may, for example, indicate or specify whether a file is visible, modifiable, compressed or encrypted.

Or

Computer file attributes are settings associated with computer files that grant or deny certain rights to how a user or operating system can access those files.

(b) Examples of computer file attributes are:

(i) Read-Only
(ii) Archive
(iii) System
(iv) Hidden
(v) Write
(vi) Execute
(vii) Read
(viii) Type
(ix) Date
(x) Protection
(xi) Size
(xii) Identifier
(xiii) Name
(xiv) Location

QUESTION 2

(a) What is *computer crime*?

(b) State *four* examples of computer crime.

(c) State *four* measures to prevent computer crime.

Satisfactory knowledge was exhibited by a sizeable number of the candidates who answered the question. This topic is trending and, with the several cases reported in the press and social media it was not surprising to read that number of answers.

The required solution follows:

(a) Also known as cybercrime, computer crime is the use of a computer as an instrument to further illegal ends.

Or

Computer crime is an illegal act perpetrated against computers and their use.

(b) Examples of computer crime include:

i. Hardware theft
ii. Software theft
iii. Unauthorised modification of software
iv. Unauthorised use of information from other computer users.
v. Gaining access to other users' computers illegally
vi. Sending viruses to other users' computers/networks
vii. Cyber bullying
viii. Email and internet fraud
ix. Identity fraud
x. Ransom ware
xi. Theft and sale of corporate data
xii. Malware attacks
xiii. Phishing etc.

(c) Measures to prevent computer crime:

- Physical access control
- Logical access control
- Use of firewall
- Encryption
- Legislation
- Use of antivirus
- Use of biometric features
- Use of strong passwords
- Do not open attachments in spam e-mails
- Do not click on links in spam e-mails or untrusted websites
- Contact companies directly about suspicious requests
- Keep an eye on your bank statements

QUESTION 3

(a) State one characteristic of each of the following network types:

(i) LAN;

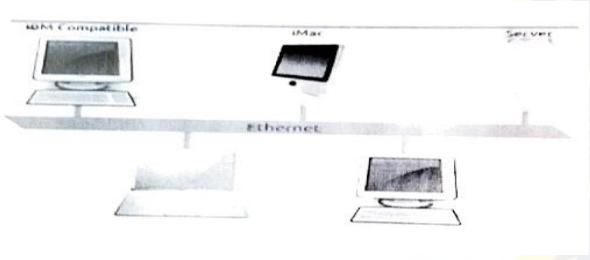
(ii) MAN;

(ii) WAN.

(b) Identify the type of network shown in (b)(i), (ii), (iii) and (iv) shown by the diagrams.

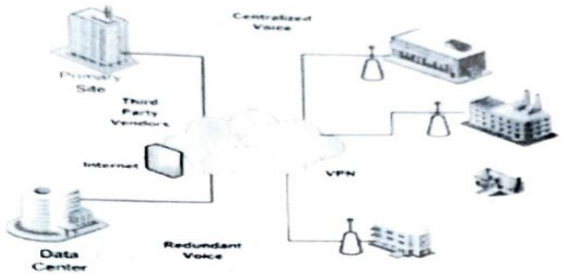
(i)

(ii)



(iii)

(iv)



Generally, candidates had a fair idea about the question. However, in part (b), candidates focused on the network topologies rather than the types of networks**.**

The solution is as follows:

(a) (i) LAN characteristics
- They allow communication in limited geographical area
- Transfer of data is fast (high bandwidth)
- Transmission media and resources are managed by the organization running the network
- Full time connectivity to local services
- Generally lower in cost than WAN
- There are various kinds of media access control methods like token ring and Ethernet

(ii) MAN characteristics
- MAN is not generally owned by a single organization
- A MAN often acts as a high-speed network to allow sharing of regional resources
- It is a large computer network that spans a city/metropolis
- Its geographic scope falls between a WAN and LAN
- MANs provide Internet connectivity for LANs in a metropolitan region and connect them to wider area networks like the Internet

(iii) WAN characteristics
-They allow communications in an unlimited geographica7lc area
-They connect multiple LANs located in same or different cities
-They are usually slower than LANs
-Transmission media and connections are managed by a third-party carrier like a telephone company

(b) (i) Wide Area Network
(ii) Local Area Network
(iii) Local Area Network
(iv) Wide Area Network

QUESTION 4

List *five*:

(a) principles of design in desktop publishing;

(b) desktop publishing hazards.

This question was answered by few candidates. Those few did quite well.

The required solution is as follows:

(a) Principles of design in desktop publishing are:

(i)	Focus	(viii)	Alignment
(ii)	Balance	(ix)	Repetition/Consistency
(iii)	Directional Flow	(x)	Contrast
(iv)	Unity/Proximity	(xi)	Emphasis
(v)	White Space	(xii)	Harmony
(vi)	Borders	(xiii)	Variety
(vii)	Choosing Type	(xiv)	Rhythm

(b) Desktop publishing hazards include:

(i)	Forgetting your audience	(v)	Grammar and spelling errors
(ii)	Irregularly shaped type	(vi)	Inappropriate borders
(iii)	Excessive underlining	(vii)	Inappropriate headlines
(iv)	Too many fonts	(viii)	Violating the copyright law

QUESTION 5

(a) What is *one-dimensional array*?

(b) Consider the variable Y of one-dimensional array with a first of six elements:

23, 7, 5, 40, 11, and 2.

Determine the value of:

(i) Y(5);

(ii) Y(2);

(iii) Y(4).

(c) Write a QBASIC program that accepts the radius (R) of a circle and displays the area (A) of the circle using the formula $A = 3.142R^2$.

This question was the least popular among candidates. Performance was poor.

The solution is as follows:

(a) A one-dimensional (or single dimension) array is a type of linear array. Accessing its elements involves a single subscript which can either represent a row or column index.

Or

A one-dimensional array is a single column/row of a specified number of rows/columns used to hold related data.

(b) Using zero based indexing, which as the design choice of many influential programming languages; we have a simpler implementation where the subscript refers to an offset from the starting position of the array, so the offset element has an offset of zero.

Thus, (i) Y(5)=2

(ii) Y(2)=5

(iii) Y(4)=11

(c) QBASIC, as a programming language, continues to be one of the least mastered topics.

The program could take this form:

```
CLS
REM Program to calculate the area of a circle
DIM A, R, as DOUBLE
INPUT "Enter the radius of the circle"; R
Let A=3.142*R*R
PRINT "Area of circle =";A
END
```

INFORMATION AND COMMUNICATIONS TECHNOLOGY (ELECTIVE) 3

1. **GENERAL COMMENTS**

The standard of the paper and that of the previous year examination is the same. It was noted that candidates' performance was good.

2. **SUMMARY OF CANDIDATES' STRENGTHS**

DATABASE

Candidates were able to create
(1) database name;
(2) tables;
(3) field names;
(4) queries.

SPREADSHEET

Candidates were able to
(1) create table and format;
(2) compute total and average scores;
(3) insert full name using the header tool;
(4) save workbook in the required name.

QBASIC

Candidates were able to
(1) declare variables;
(2) input given data;
(3) format the required output;
(4) save program as PALINDROME.

3. **SUMMARY OF CANDIDATES' WEAKNESSES**

The following were the main candidates' weaknesses identified:

DATABASE

Candidates were not able to create
(1) proper form;
(2) list all officers receiving quantities less than 450;
(3) arrange data in table by commodity in descending order.

QBASIC

Candidates' programs could not
(1) test for palindrome properly;
(2) display NOT Palindrome and Palindrome onscreen.

4. **SUGGESTED REMEDIES**

(1) Teachers must ensure that candidates understand the importance of naming objects in information and communications technology in general.

(2) Candidates should be taught how to design forms using form Design more than using the Form Wizard. This will help them understand the labeling of forms.

(3) Candidates should be taught how to query data to extract information as required.

(4) Candidates should be taught how to handle input data to ensure that the input is in the exact form as required by the software.

5. **DETAILED COMMENTS (QUESTION BY QUESTION)**

QUESTION 1

Candidates were required to create a database name, structure of a table, fields and form.

Candidates were expected to:

Set data-type for Commodity as Text

Set data-type for Quantity as Number

Set data-type for Waybill No as Text

Set data-type for Date Received as Date with a special format dd/mm/yy for two digit day, two digit month, and two digit year respectively separated by the "/".

The form can be created using the Form Wizard. However, it must be noted that the form wizard picks the table field names as default Form labels. In this question, in creating the form, it must be noted that the label for "Rec Officer" field is "Receiving Officer" and hence a modification is required after the Form Wizard created the form with default labels.

Note that many candidates entered the data direct in the table and not through the form which was contrary to what was expected.

General performance was good.

QUESTION 2

(a) Candidates were expected to create a given table exactly as presented on the question paper.

(b) Candidates were also expected to compute total and average scores in the table, format average scores to two decimal places and save workbook as RESULTS.

(c) Some candidates summed up the Total Score and Student Average columns which were not required by the question.

(d) The general performance was good.

QUESTION 3

Question on QBASIC was the least popular among the candidates. However, the few that answered performance were good. The following is a basic outline pseudocode to assist test coding for solving the problem.

Declare variable for the word
Declare variable for the reverse word
Declare variable for counter

Input the word
Reverse the word
Ensure that the two words are all lowercase, then
Test for equality of the word and the reverse word
If they are equal then output palindrome validity on screen
Otherwise, output palindrome invalidity on screen

The general performance was average.

METAL WORK 2

1. GENERAL COMMENTS

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

Candidates' performance was above average.

2. SUMMARY OF CANDIDATES' STRENGTHS

(a) Majority of the candidates produced good responses for the question on forge work (i.e. question one).

(b) Candidates were able to answer the number of questions required.

3. SUMMARY OF CANDIDATES' WEAKNESSES

a) Some candidates could not provide neat sketches.
b) Candidates failed to clearly explain technical terms.

4. SUGGESTED REMEDIES FOR THE WEAKNESSES

(a) Tutors should give candidates activities in sketching of tools, equipment and processes.
(b) Candidates should be taken through explanation of technical terms in metalwork.
(c) Teachers should constantly use technical jargons in their dealings with students.

5. DETAILED COMMENTS

QUESTION 1

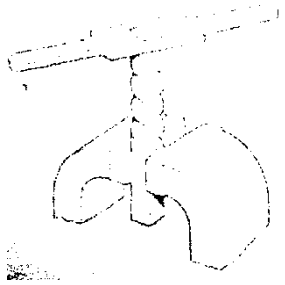


Figure 1

Figure 1 shows a forging operation.

(a) (i) Name the operation.
(ii) List the tools used for carrying out the operation.
(iii) State five steps involved in carrying out the operation.

(b) List two forge fire tools.

(a - b) Performance of candidates in this question on forge work generally, was good.

QUESTION 2

(a) Explain the following terms in machining;
(i) Chamfering;
(ii) Knurling.

(b) State two safety precautions each to be observed when;
(i) Chiseling;
(ii) Grinding.

(c) Sketch a straight knurling tool.

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

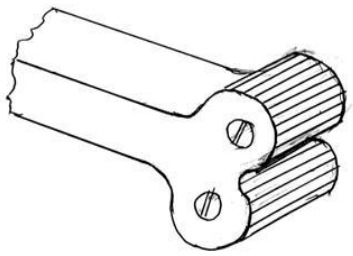
(a) A few candidates could explain the terms chamfering and knurling. Chamfering is cutting a bevel on the edge of a workpiece, where as knurling is embossing a straight or diamond pattern on a workpiece for firm finger grip.

(b) Performance in stating safety precautions each to be observed in chiselling and grinding generally was encouraging. They include:

(i) Chiselling:
- Use chisel without mushroom head.
- Wear goggles.
- Grip workpiece firmly.

(ii) Grinding:
- Use eye guards
- Use goggles
- Hold small work in a hand vice

(c) Most candidates could not sketch a straight knurling tool. The required sketch is shown below:



QUESTION 3

(a) State two reasons why non-ferrous metals are used for beaten metal work.

(b) State two suitable surface finishing processes each for the following:

i. Aluminum dishes;
ii. Bicycle frames;
iii. Sheet steel litter bins.

(c) (i) State one physical test used to identify cast iron.

(ii) State two uses of mild steel.

(a) A few of the candidates could explain why non-ferrous metal are used for beaten metalwork. The reasons to be given include the following; because they are ductile, malleable, workable and soft.

(b) (i - iii) Candidates were able to state two suitable surface finishing processes for the following; aluminium dishes, bicycle frames and sheet steel litter bins.

(c) (i) This part of the question demanded that candidates state one physical test used to identify cast iron. Majority of the candidates provided good responses (i.e. spark test, filing test, dropping test and cutting test).

(ii) A good performance by candidates in stating two uses of mild steel. They stated that mild steel is used in motor vehicle parts, producing bolts and nuts, structural work, roof trusses, ornamental work, agricultural implements and metal doors/gates.

QUESTION 4

(a) Explain the following foundry terms:
(i) core print;
(ii) cavity.

(b) State two qualities of a moulding sand.

(c)(i) Sketch a carburising flame;

(ii) Label two parts of the carburising flame sketched in (c)(i).

a) (i - ii) This part of the question demanded that candidates explained the following foundry terms; core print and cavity. Responses were satisfactory.

b) The qualities of moulding sand required refractoriness, permeability, compatibility, collapsibility and reusability. Some candidates did well.

c) The sketch of a carburising flame was not good. Some candidates sketched the oxidising flame or the neutral flame.

QUESTION 5

(a) Explain the following design terms:
(i) Pre-conceived idea;
(ii) Annotation.

(b) State two differences between cold and hot chisels.

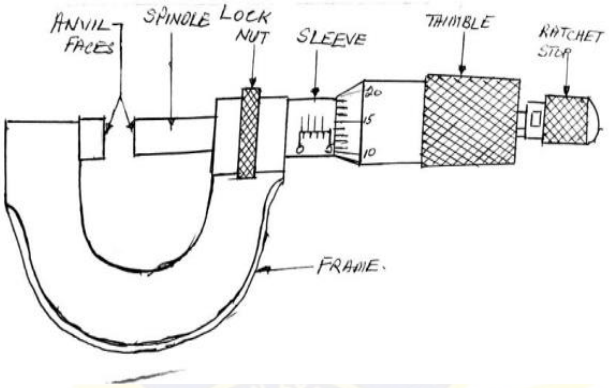
(c) (i) Sketch a micrometer screw gauge;
(ii) Label two parts of the micrometer screw gauge sketched in (c)(i);
(iii) State one use of the micrometer screw gauge.

a) (i - ii) The terms pre-conceived idea and annotation were not properly explained. The expected response is

Pre – Conceived Idea:
Having a prior thought of solution to a particular problem
(ii) Annotation
Notes added to the possible solution to explain the drawings/sketches in terms of shape, material, construction, function and reason for accepting or rejecting the solution.

b) Majority of the candidates were able to explain the differences between cold and hot chisels. Hot chisels have point angles of 30^{o} while, cold chisels have point angles of 60^{o}. Hot chisels are thinner while, cold chisels are thicker; hot chisels are used to cut hot metal while cold chisels are used to cut cold metals.

c) A few candidates could sketch a micro meter screw gauge, label two parts and state one use of the tool. The expected sketch is shown below:



METAL WORK 3

1. GENERAL COMMENTS

The general performance of candidates in the year's paper in metalwork 3 could be compared with those of previous years. The candidates performed satisfactorilyy and well above average standard. Most of the candidates exhibited good craftsmanship in their work and also observed basic rules of the vocation which resulted in producing next pieces of work.

There were minimal cases of production errors hence preventing the spoilage of candidates artefacts produced. The questions which were developed for the paper were appropriate and suitable for the level. The different level and quality of questions were satisfactory. The topics from which questions were constructed and assembled bore relevant criteria or principles of the approved syllabus.

The marking scheme which was designed for the marking of scripts, covered all the basic skills and practices required to be assessed. It captured the least performance of each candidate and all performance of work output was fairly awarded by applying the best marks distribution practices.

Candidates' bias for the fitting question i.e. Question 1in the paper was scoring against the selection of the, machining question i.e. Question 2 of the paper. Candidates selected to answer and attempt the fitting exercise at the expense of the machining exercise. Candidates' exposure to machining activities should be encouraged in all schools.

2. A SUMMARY OF CANDIDATES' STRENGTHS

The strengths of candidates in the examination which were commendable include; the following;

(1) Ability to understand and interpret working drawings to realize the artefact.

(2) Adoption of best engineering practices, including marking out of profiles or outlines of the expected artefacts.

(3) Improved close cutting and filing of workpieces.

(4) Ability to select appropriate tools required to be used to carry out the production of the workpieces.

(5) Improved ability in filing, enabling the achievement of the desired tolerance of finish i.e. $\pm$ 1mm.

(6) Observation of workshop safety practices and proper handling of tools.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

Candidates' weaknesses in the performance of the exercise include:-

(1) Inability and failure to use chisels to cut grooves and slots.

(2) Lacking the ability to deburr and remove sharp edges of all filed faces.

(3) Failure of not producing relief holes for the work as indicated on the working drawing.

(4) Failure in providing reasonable size of cotton bag to enclose the finished workpieces.

(5) Using difficult and complete knots instead of simple knots to tie cotton bags.

(6) Lack of skills in machining and manipulation and use of the centre lathe machine.

4. SUGGESTED REMEDIES FOR THE WEAKNESSES

(1) Students should be trained to use chisels to produce neat and clean cuts.

(2) Students should be encouraged to adopt safe and good engineering practices.

(3) Students should be given sufficient exercise to practice and produce on the centre lathe.

5. DETAILED COMMENTS

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

QUESTION 1

The following materials are supplied:

(a) Two flat mild steel plate, 60mm x 55mm x 3mm for parts A and B;

(b) One cotton bag, 100mm x 70mm to enclose the finished work;

(c) Two tie-on labels.

Figure 1 shows the assembly and detailed views of each part of a fitting exercise. Using the materials supplied, prepare the parts and assemble the pieces.

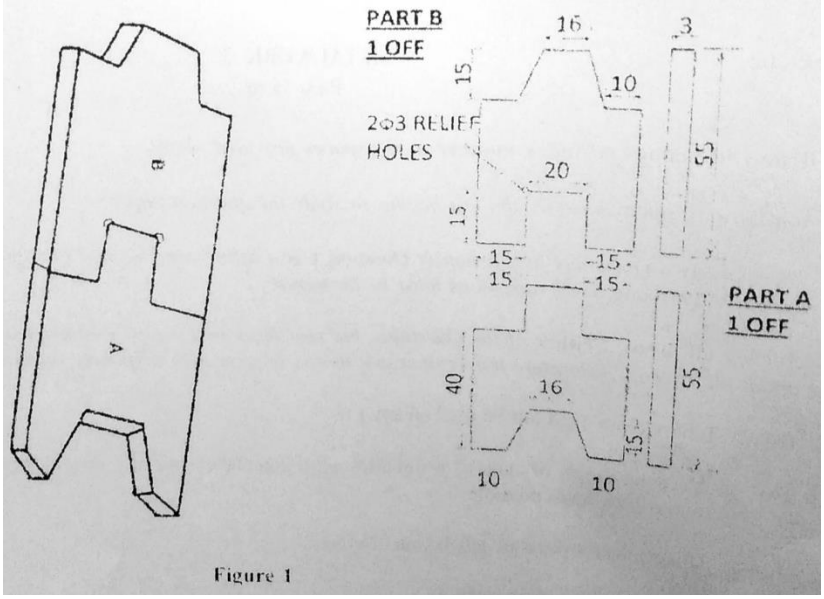


Figure 1

This was a very popular question which majority of the candidates attempted to answer.

The candidates were supplied with (a) flat mild steel plates, measuring 60mm x 55mm 3mm to bag 100mm x 70mm to enclose the finished work and (c) two toes- on labels.

Candidates were first required to carry out proper marking out of the profile of the artefact on the two supplied workpieces per the dimensions on the working drawing. When the lines scribed out failed to show clear outlines, the profiles failed to show clear outlines; the profiles should further be dot-punched to show clearer lines for cutting out, care should be exercised to enable participants cut close to the marked lines.

On completing the cutting using either hacksaw or chisel where applicable or feasible, a student was required to use smooth file to finish to the required size or a rough file to reduce the workpieces to required size and profile. Many candidates followed the appropriate steps and obtained neat piece of work.

Obviously, the tapered slot of the part A was difficult to cut and shape, therefore required care and skill to obtain good work. Many candidates lost control of chisels hence, resulted in rough cuts, over size shapes and under size shapes as well.

Again in many cases, for lack of accounts dimensional control and filing, the parts which were prepared by candidates could not fit well or would not fit at all.

After filing to produce the parts, candidates were required to deburr and remove all sharp edges; which many candidates failed to perform. The relief holes indicated on the working drawing were necessary to be produced to facilitate fitting and assembling of the parts. Many candidates failed to carry out these drilling of the relief holes.

Candidates should learn to file flat and straight. These practices could be achieved if candidates could always place the file on the workpiece without rocking and ruggedly filing. Good practices could improve candidates work output.

QUESTION 2

The following materials are supplied:

(a) One piece free cutting mild steel rod, Ø50mm x 100mm;

(b) One cotton bag, 170mm x 70mm to enclose the finished work;

(c) Two tie-on labels.

Figure 2 shows the detailed view of a machined part. Produce the part using the material supplied.

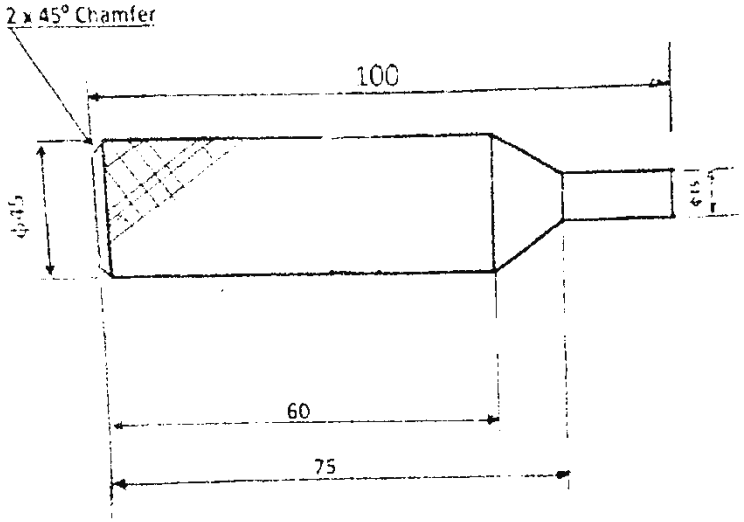


Figure 2

Candidates failed to attempt this particular exercise involving the application of the centre lathe machine tool to produce the workpiece as indicated in figure 2. Having the requisites skills and know how; it was the simplest exercise that could be completed with the allowed time with ease and little effort.

Candidates were supplied with one piece free cutting mild steel rod Ø50mm x 100mm long, (b) one cotton bag 170mm x 70mm to enclose the finished work and two - tie- on labels to prepare the machined part indicated on the working drawing in Figure 2 to a tolerance finishing $\pm$0.5mm for maximum marks of 100.

However, many candidates did not attempt it at all. The workplace was partially finished to the required length of 100mm and candidates were only required to reduce the diameter of the rod from 50mm to 45mm; that was above 5mm metal to be removed. The 45mm diameter rod machined could later be knurled to the length of 60mm. The tailstock end of the rod should be further reduced to 15mm diameter by a length of 25mm towards the opposite end.

In between the knurled length and the 15mm diameter end of the rod; candidates were required angle of taper to machine the indicated short taper. After the exercises, candidates were required to use the face of the tool to develop changes 2mm x 45^0 at the headstock end of the rod to complete the exercise.

TECHNICAL DRAWING 2

1. GENERAL COMMENTS

The paper compared favourably with that of the previous year. Their performances were good.

2. SUMMARY OF CANDIDATES' STRENGTHS

(a) Most candidates used the correct grade of pencils; the outlines were clearly different from the construction lines.

(b) The hatch lines had the correct spacing.

(c) The procedures for producing true shapes were done accurately by few candidates.

(d) Few candidates produced the given lamina correctly. The construction for the centroid was perfect.

(e) Their line work and neatness were commendable.

3. SUMMARY OF CANDIDATES' WEAKNESSES

(a) Pencil works by few candidates were deplorable. The work became very dirty.

(b) Few candidates could not visualize and did not understand the auxiliary views. They did not follow the 30^0 lines for projection for the auxiliary view.

(c) Some of the vertical and horizontal projectors were not accurate and sometimes very difficult to differentiate from outlines.

(d) The construction of the locus was poor. Candidates did not follow the correct procedure for producing the locus.

(e) Some candidates did not divide the lamina accurately. The overall work was poor. There was poor construction of the horizontal and vertical diagonals.

(f) Spaces for the Bow's imitation were neglected thus candidates could not obtain the current procedure to locate the centroids.

(g) Few had the construction correct but did not state and measure the values.

4. SUGGESTED REMEDIES

(a) The grade of pencils to be used for drawing must be stressed and candidates were not to use BB pencils for their work.

(b) Candidates' revision must not be centred on final year work but should involve the three years work.

(c) Candidates are advised to practice more work on centroids and simply supported beams.

(d) Candidates' should be advised to work on scale conversions and become familiar with using the conversion for drawings.

9. DETAILED COMMENTS

QUESTION 1

The sketch in Fig.1 shows two views of a block in first angle orthographic projection.

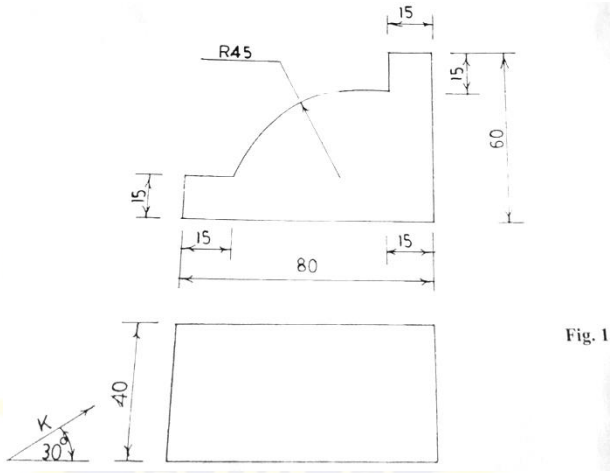


Fig. 1

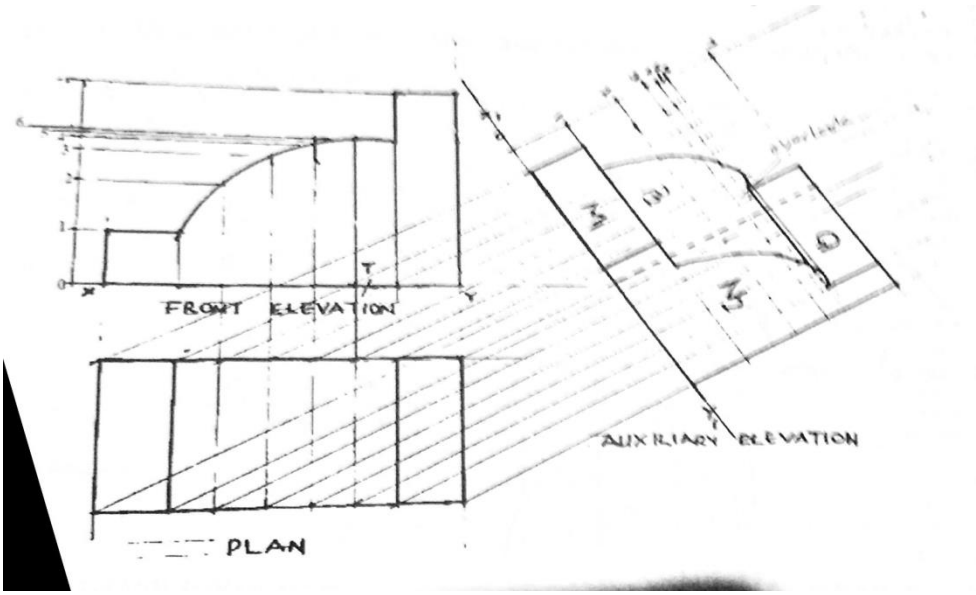
Draw, full size, the;

(j) Given views with the plan;
(k) Auxiliary elevation in the direction of arrow K.
[Show details]

(A) TWO GIVEN VIEWS .I.E. FRONT ELEVATION AND PLAN.

Candidates were to produce the two views as well as the auxiliary elevation: Most candidates copied the given views wrongly and also produced the auxiliary elevation on different angle of projection .i.e. on 45^0 instead of 30^0.

Projection lines at 30^0 were produced from the plan to obtain the auxiliary projection. The new projected auxiliary lines was used as a datum for obtaining the various coordinates for the new faces. The new faces as M_1, M_2, P_2, and Q_1 were obtained to complete the auxiliary views. The required drawing is shown below:



QUESTION 2

The sketch in Fig.2 shows the elevation of a truncated right cone.

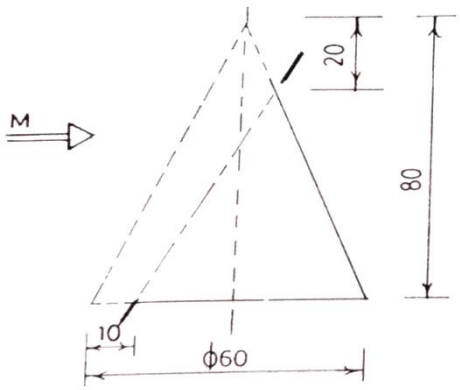


Fig. 2

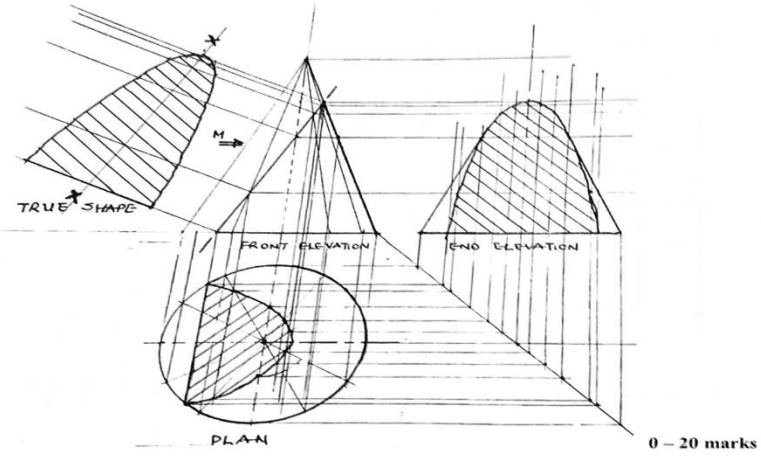
Draw, the full size, the:

(k) given view;
(l) plan;
(m) end view in the direction of arrow M;
(n) true shape of the cut surface.

ELEVATION OF THE TRUNCATED RIGHT CONE

a. THE GIVEN VIEW: to copy the given elevation and produce the plan. The plan of the elevation was constructed before the elevation. The given diameter was used to produce the circle which was divided into 2 equal parts. The height and the cutting plane were measured at given positions. The direction of arrow M was taken and the various projected lines were constructed to undertake the end view of the surface.

b. THE TRUE SHAPE: the projected perpendicular lines were taken from the act surface. Reference line was drawn across the perpendicular lines. The corresponding coordinates were taken from the cut surface on the plan to the reference line for the true surface. The various points were joined to obtain the curve for the true shape. The required sketch is shown below:



0 – 20 marks

QUESTION 3

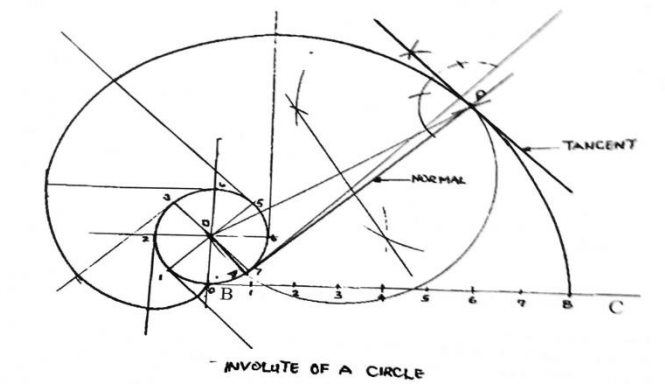
(a) Construct an involute to circle R20, starting from the lowest point of the circle and in a clockwise direction.

(b) Draw a tangent to the involute in 3(a) at point P, which is located on the involute at 70 to the right of the vertical centre line.

CONTRUCTION OF THE INVOLUTE AND ITS TANGENT

The given circle 040 was drawn and divided into 12 equal parts. Tangential line equal to the circumference to the circle was constructed and divided into the same equal parts. Tangential lines were constructed on the divisional points on the circle and successive points used in conjunction of the radius to obtain points for the involute. Various points were joined with a smooth curve to obtain the involute.

The position of point P on the curve was measured to the right. Point P and the centre of the circle were joined with a straight line. The procedure for obtaining the normal was used and the line was unable to construct the tangent to the given point. The sketch is shown below:



QUESTION 4

In the link mechanism shown in Fig.3, OA revolves clockwise about O. AB slides through a pivoted block, C

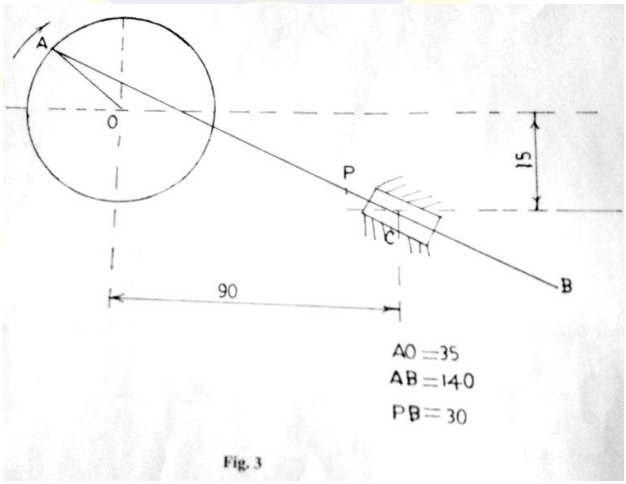
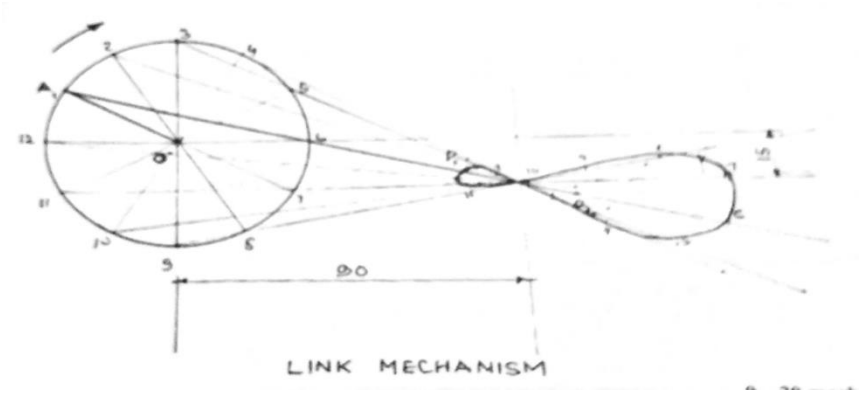


Fig. 3

Draw the locus of point P for the on revolution of OA.

OBTAINING THE LOCUS: The given link mechanism with the crank were copied with the given direction. The circle was divided into 12 equal parts. The rod was located at different positions in order to mark different positions of point P.

Most candidates could not locate the points effectively and failed to use the units to correct scale. The curve is as similar to that of a shape of an ellipse. The sketch is shown below:



QUESTION 5

The sketch in Fig.4 shows a lamina.

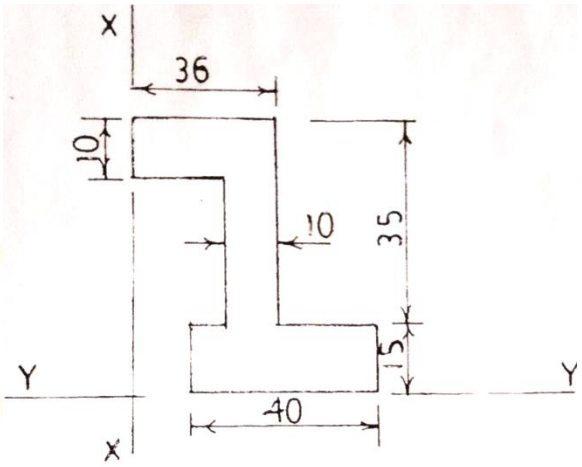


Fig. 4

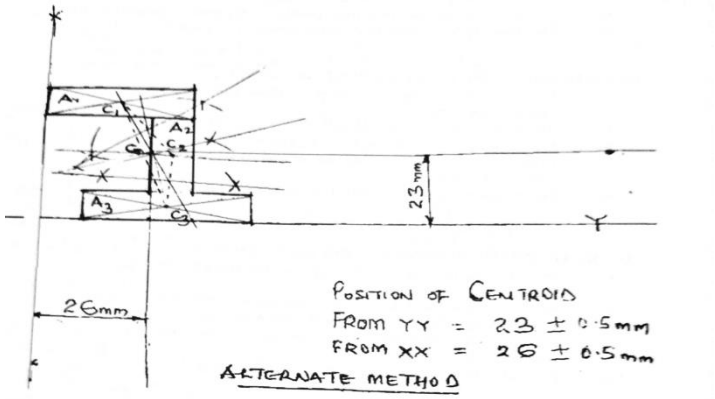
Using graphical method, determine the centroid of the lamina from axes X and Y.

CONSTRUCTION OF A CENTRIOD OF LAMINA

Most candidates constructed the given lamina and could not continue. Other candidates constructed the lamina and further divided it into three rectangles.

There are two different methods of obtaining the centroid of the lamina. The lamina was divided into three rectangular shapes and the diagonals were constructed. The horizontals were joined to obtain the respective initial centroids. Bow's notation was taken on the spaces created. The area for each rectangle was calculated using the given scales. Few candidates could not work up to the areas.

The vertical and horizontal line of actions was drawn to obtain the final centroid. The position of the centroid was measured from the faces XX and YY of the given faces. The sketch is shown below:



POSITION OF CENTROID
FROM YY = 23 ± 0·5mm
FROM XX = 26 ± 0·5mm

ALTERNATE METHOD

TECHNICAL DRAWING 3

1. GENERAL COMMENTS

The standard of the paper compared favorably well with that of the previous year. The performance of the candidates was average.

2. SUMMARY OF CANDIDATES' STRENGTHS

(a) Majority of the candidates' adhered to the rubrics in answering the questions.

(b) Most of the candidates used required scale and the drawing equipment to produce good drawings.

(c) With good knowledge in orthographic projection candidates could position views correctly, and draw pictorial views.

(d) Labelling of views and stating facilities on building plans.

3. SUMMARY OF CANDIDATES' WEAKNESSES

(a) Candidates did not have adequate knowledge of workshop tools; they could not sketch mortise gauge or simple fastener, such as countersunk rivet.
(b) Candidates sketching skills was generally weak, as the sketches lacked proportion, or were done with the aid of rules, set-squares, etc, contrary to the rubric.
(c) Candidates' knowledge on hatching/sectioning of cut portions of components was weak as in mechanical.
(d) The drawing of conventions for building parts in a section view, such as earth filling, concrete slab, floor screed, lintel, doors, roof members, etc were wrongly done.

(e) Lines such as centre line, cutting plane, ridge, beams, etc, were not drawn in most cases.

(f) Pencil work was generally poor.

4. SUGGESTED REMEDIES

(b) Freehand sketching techniques, with the use of pencils only, should be taught in class, and enough exercises given.
(c) Visits to industrial sites and workshops can be organized for students in addition to good charts, to expose them to common tools.

(c) Candidates should learn drawing standards, symbols and conventions from BS 308A and BS1192, or good books, in order to apply them when drawing.

(d) Correct hatching/sectioning must be taught.

10. DETAILED COMMENTS

QUESTION 1

The sketch in Fig. 1 shows three views of a block.

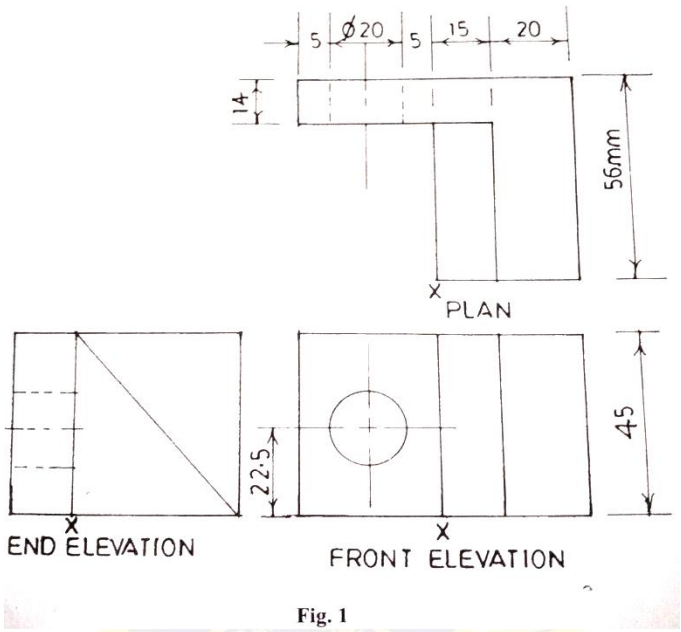
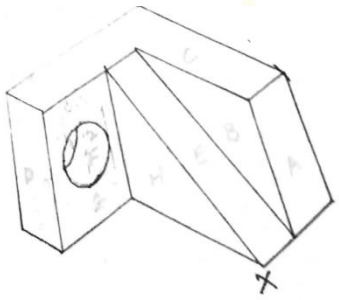


Fig. 1

Make a full-size freehand sketch of the isometric view of the block, making X the lowest point.

Three views of a block were given and candidates were to make a freehand isometric sketch of the block with 'X' at the lowest point. Most candidates made good sketches but used drawing instruments to guide them and therefore lost some marks. Majority did not draw the centre lines and the circle as an ellipse.

The Candidates' performance was above average. The required sketch is shown below



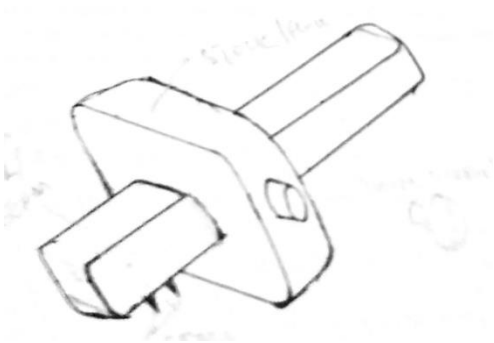
QUESTION 2

Make a freehand sketch of the pictorial view of a mortise gauge.

The candidates were to make a freehand pictorial sketch of a mortise gauge.

Majority of the candidates could not differentiate between marking gauge and mortise gauge, and therefore sketched a marking gauge. Majority of the sketches were pictorial, but as guided sketches, and parts out of proportion.

Candidates' performance was below average. The required sketch is shown below:



QUESTION 3

Make a freehand sketch of the pictorial view of a countersunk head rivet pin.

The candidates were to sketch a freehand pictorial view of a countersunk head rivet pin.

Majority of the candidates could not make the pictorial of the rivet.

Candidates' performance was below average. The expected sketch is shown below:

QUESTION 4

Fig.2 shows the sketch plan of a bungalow. Study the given specifications and answer the questions that follow.

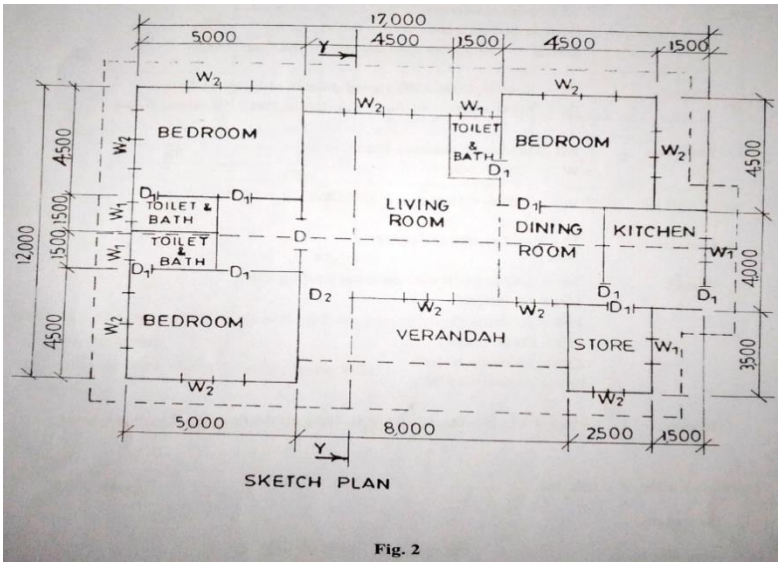


Fig. 2

FOUNDATION: **750 x 250 concrete strip at a depth of 900 below the ground level.**

WALLS: **All walls are 225 sandcrete hollow blocks.**

FLOOR: **350 hardcore; 150 concrete slabs; 25 cement sandcrete;**

Floor to ceiling 3100;

dining – 150 higher than the rest of the floor level

DOORS: **D_1 - 2100 x 1800 x 40 glazed door in aluminium frame;**

D_2 – 2100 x 1800x40 flush wooden in 100x50 timber frame.

WINDOWS: **All glazed in aluminium frame;**

W_1 - 750 x 900;

W_2 - 1200 x 1800.

LINTEL: **225 x 225 reinforced concrete.**

BEAMS: **225 x 225 reinforced concrete 2400 above floor level.**

ROOF: **30^0 x double pitch with asbestos roofing sheet;**
150 x 50 rafters;
100 x 50 struts;
150 x 50tie beam;
250 x 35 fascia board;
Eaves projection 900.

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

(i) floor plan;

(ii) front elevation.

(i) The floor plan was attempted by all the candidates. Good drawings were made, except that; some candidates did not draw the cutting plane, beams. Eaves projection, and the facilities, such as rooms, verandas, etc were not written leading to loss of marks.

(ii) The front elevation was attempted by most of the candidates. Majority of the candidates could draw the roof, showing the fascia and eaves, walls and ground line. Some candidates did not draw the floor level, the beam and all the walls. The door and windows were not drawn with correct conventions.

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

The sectional detail was not attempted by some candidates. Majority of these who attempted it could draw the foundation footings and walls by using the correct conventions or symbols. The floor details; i.e. hardcore, concrete slab, screed, earth, etc were drawn, but some had difficulties in their arrangement or positions. The sectional walls with their lintels, door and window were drawn leaving the walls in elevation, beam and floor at dining area.

Some of the candidates had difficulties drawing the roof details, i.e. rafters, purlins, struts, ceiling etc.

Candidates' performance was satisfactory.

QUESTION 5

The sketch in Fig. 3 shows two views of a block in first angle orthographic projection.

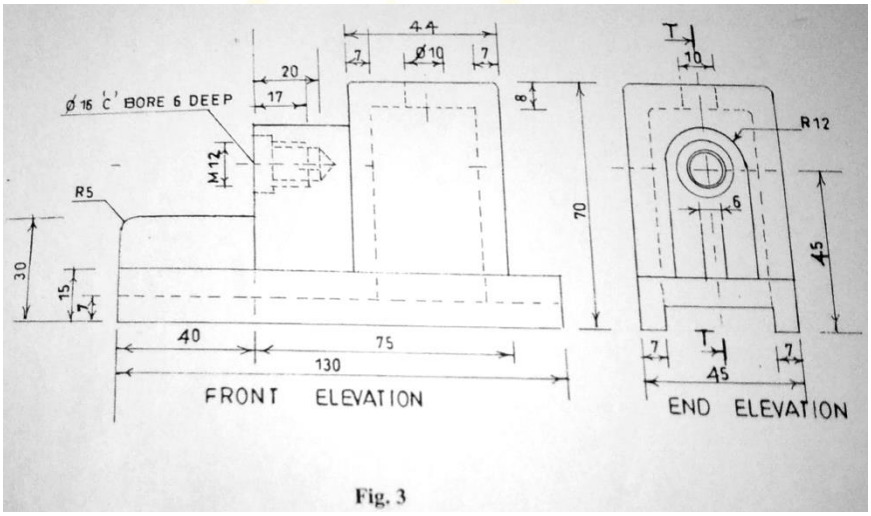


Fig. 3

Draw full size, in first orthographic projection, the:

(a) end – elevation
(b) sectional front elevation along plane T - T;
(c) plan.

(Assume suitable dimension(s) where unspecified.)

The question was set to test among other skills, sectioning of cut portions, drawing of threads, drawing third views, etc.
Candidates' performance was satisfactory.

The End elevation was drawn by all the candidates correctly but the cutting plane and centre lines were not drawn.

The Sectional front elevation was drawn by majority of the candidates. The hidden lines were drawn visible to reveal the slot at the base, hollow portion, and the M 12 Counter bore hole.
Candidates difficulties had to do with the correct drawing of the M12 counter bore hole and the sectioning as most of them hatched almost everything; webs slots etc.

The plan was poorly drawn by majority of the candidates. With the exception of the Ø10 hole, the general outline, and in a few cases, the counter bore threaded hole, the other portions were not correctly drawn.

Candidates' performance was above average.

WOODWORK 2

1. GENERAL COMMENTS:

The standard of the paper was good and compares favourably with that of the previous year.
The candidate's performance was also satisfactory as compared with that of the previous year.

2. SUMMARY OF CANDIDATES STRENGTHS:

(a) Candidates performed very well in the following:

SECTION A

- Stating two safety precautions to be observed when operating a portable power tool.
- Stating the main use of the Forstner bit.

- Listing four parts of a wood lathe
- Listing the two methods of seasoning timber.

SECTION B

- Good pencil work
- Neat drawings
- Indicating a selected freehand pictorial sketch for development.

3. SUMMARY OF CANDIDATES WEAKNESSES

(a) Candidates showed the following weaknesses:

SECTION A

- Inability to sketch the forstner bit
- Inability to state any two steps involved in sharpening a chisel
- Failure to state the reason why an adhesive is recommended for internal use only.

SECTION B

- Failure to show the cutting plane on the front elevation, and to dimension work.
- Failure to state the scale used in the drawings.
- No border lines and title blocks.

4. SUGGESTED REMEDIES:

(a) Candidates must be given adequate exercises in drawing to enable them get used to providing cutting planes, border lines, title blocks and indicating the scale of the drawing with dimensions.

5. DETAILED COMMENTS.

SECTION A

Question1

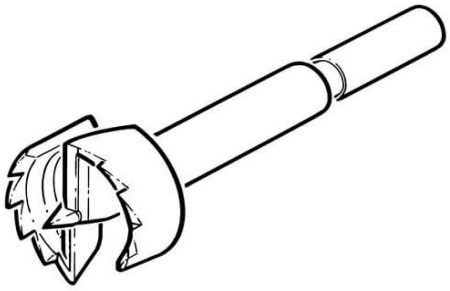
(a) State two safety precautions to be observed when opening a portable power tool.

- In finding solution to this question, candidates performed creditably.

(b) Sketch the Forstner bit.

- The tool is not a frequently used one. Thus, some candidates did not even attempt it at all. Those who attempted it did not do well.

The sketch is shown below:



Forstner bit

(c) State the main use of the Forstner bit.

- Though candidates could not sketch the tool, they were able to state its main function.

Question 3

(a) List four parts of a wood lathe.

- Listing four parts of a wood lathe was not a problem or challenge to candidates. Their performance was excellent.

(b) State any two steps involved in sharpening a chisel.

- Performance here was below average. Candidates were expected to write: support to oilstone firmly in a vice or against a stopper; apply oil to the oilstone; hold the chisel at a constant angle (25^0 - 30^0) to the oilstone; hour the chisel until a burr is formed; remove the burr that is formed at the back of the cutting edge. Many of them failed.

(c) List one tool each belonging to each of the following types of portable power tool.

(i) Sander:

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

(ii) Saws:

Candidates could not answer this question. The expected answer include: Jig saw/Saber saw or Power circular saw.

Question 4

(a) Explain why a screw has a stronger holding power than a nail.

A few candidates were able to some explain the question.

- A screw has a stronger holding power than a nail because the screw has thread on its shank which cuts into the fibers of the wood, with the wood also exerting pressure on only the shank at a nail.

(b) List the two methods of seasoning timber.

- The two methods of seasoning timber was wellanswered. The performance by candidates on this was excellent.

(c) Explain the function of stickers in timber seasoning.

- Performance here was average; candidates were expected to state or explain that stickers are used in seasoning to make sure that air can circulate around the stack of timber or distribute the weight of the timber vertically from top to bottom.

(d) State the reason why an adhesive is recommended for internal use only.

- An adhesive is recommended for internal use only when it is not resistant to water, moisture or weathering; candidates performance was just average.

SECTION B

A desk is to be designed to the following specifications:

Height - 700

Width - 100

Depth - 450

(All dimensions are in millimetres)

The desk has a drawer and a lockable door on one side. All other details are left to the candidates.

Questions

1. **Make two different preliminary freehand pictorial sketches of the design of the desk.**
   - The word "Desk" confused some candidates that they produced sketches of "Mono Desks" instead of "Writing Desk". The provision of a drawer and a lockable door should have informed them of a writing desk.
   - Almost all candidates attempted this question with a few candidates providing only one sketch.

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

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

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

(a) Front Elevation:

- All candidates attempted this question and placed the view in its proper quadrant with regards to the Third Angle Projection.
- A few candidates failed to show the following: Drawer, lockable door, dimensions, scale, cutting plane, the view was not named.

(b) Sectional End Elevation:

- Majority of candidate's performance was woeful.
- They failed to show the drawer and door in section. Some did not indicate any section at all.

DRAUGHTSMANSHIP

i. Majority of candidates failed to draw border lines.
ii. Title Block:
Most candidates if not all, did not provide the title block on the paper.
iii. Layout :
Candidates did well in this.
iv. Neatness:
Neat drawings were produced.
v. Scale:
Majority of candidates did not indicate the scale, 1:5 on their drawing sheets.

WOODWORK 3

1. GENERAL COMMENTS

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

All the questions were based on the syllabus. The questions were well constructed and satisfactory enough to cater for the level under review.

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

2. SUMMARY OF CANDIDATES' STRENGTHS

Some candidates exhibited appreciable skills in the following areas:

1. Candidates' ability to read and interpret the working drawings correctly.
2. Candidates' ability to mark-out to the stated dimensions on the detailed drawings.
3. Candidates' ability to saw successfully and demonstrated improvement in the chiselling work.
4. Candidates' ability to assemble the various work pieces together to complete the required nail box.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

1. Quite a number of candidates inability to read and interpret the working drawings correctly.
2. Some candidates' inability to mark-out accurately.
3. Candidates' inability to cut and remove waste accurately
4. Candidates' failure to use well sharpened cutting tools.

4. SUGGESTED REMEDIES FOR THE WEAKNESSES

To remedy these weaknesses it is recommended that:

1. Teachers should intensify the teaching of orthographic drawings.
2. Teachers should give enough practical exercises which involve the reading and interpretation of working drawings.
3. Teachers should impress upon students to use well sharpened tools.
4. Teachers should teach and demonstrate the correct procedure for marking-out on workpieces.
5. Candidates must acquire the basic techniques of sawing chiselling accurately through constant practice well ahead of the final year practical examination.
6. Teachers should ensure that candidates use correct and appropriate tools to execute every operation during practicals.

5. DETAILED COMMENTS

QUESTION 1

1. **Make the test piece shown on page 2, using the timber which has been planed to the following sizes (All dimensions are in millimeters):**

   2 pieces hardwood – 210 x 100 x 20;

   2 piece hardwood – 130 x 100 x 20;

   1 piece hardwood – 130 x 100 x 20;

   1 piece – 105 x 200, 6mm plywood;

   8 nos. Dowels – 12mm wire nail.

2. **You may use any of the ordinary hand tools but the use of glue, glass-paper, files, rasps and scrapers is not allowed.**
3. **Any dimension which is omitted from the drawing are left to your own discretion.**
4. **If you make any mistake, work as near to the drawing as possible. Additional materials will not be supplied.**
5. **Print your name and index number clearly on each piece of wood and assemble your work before handing it over to the supervisor.**

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

The work involved the following processes:-

(a) Construction of through dovetail joints;
(b) Construction of bare face mortise and tenon joints;
(c) Running rebates;
(d) Fitting and fixing plywood bottom;
(e) Finishing.

1. **Through Dovetail joints**

The question was attempted by all the candidates. a good number of candidates were able to mark-out accurately and produced fairly good joints. However, a few of the candidates constructed box-in joints instead of the through dovetail joints. Majority of the candidates marked-out the through dovetail joints which are from 1:6 to 1:8. The pitches the candidates used were out of proportion. Some of the candidates lacked the requisite skills to cut and remove waste wood from the tails and sockets of the joints and as a result produced very poor work.

2. **Bare Face Mortise and Tenon Joints**

The constructions of the bare face mortise and a tenon joint at the middle of the top of the box was to provide a handle for nail box.

This question was attempted by almost all the candidates. Some of the candidates were able to mark-out accurately and produced very good joints. However a few of the candidates constructed through mortise and tenon joints instead of the barefaced mortise and tenon joints.

A small percentage of the candidates were able to mark-out but were unable to cut out the waste wood. A few others did not attempt the question at all.

3. **Rebates**

Candidates were expected to cut rebates at the inside of the base of both the sides and ends of the box to receive the plywood bottom.

Majority of the candidates attempted this question. Most of those who attempted were able to cut the rebates successfully. Some candidates were able to cut the through rebates on both ends of the box instead of the stopped rebates they were expected to cut.

4. **Fitting and Fixing Plywood Bottom.**

Candidates were expected to plane the sides and ends of the plywood to fit into the rebates to form the bottom of the nail box. A few candidates were able to prepare the side and ends of the plywood and fixed it neatly by nailing using all the 8 nails as stipulated on the material list. Others did partial planning before fixing the plywood bottom in place.

A small percentage of the candidates failed to prepare the sides and ends of the plywood, and did not run the rebates, yet they managed to nail the plywood bottom in position. Most candidates failed to fix all the stipulated 8 nails as required strengthen the plywood bottom. Some candidates could only fix as few as two, three and in most cases four nails only.

5. Finishing

(i) Assembling

Majority of the candidates were able to assemble to their work. A few did partial assembling. The rest of the candidates could not assemble the work but tied the workpieces together for easy identification.

(ii) Squareness

Most of the candidates were able to construct the nail box with all the four corners meeting at 90^0. The remaining were all out of squareness.

(iii) 3 Major Dimensions

Candidates were required to work to the required dimensions namely length, width and height as provided on the working drawings. Most of the candidates were able to work to the required dimensions. The remaining candidates produced the work slightly bigger than required.

(iv) Dressing

Candidates were required to clean the surfaces of the work of all pencil marks using the smoothing plane to give it the needed appeal. Almost all the candidates failed to dress the work. This is a perennial challenge.