3.8 AVIATION TECHNOLOGY (450)

The 2012 KCSE examination for Aviation Technology consisted of two papers namely Paper 1 (Theory) and Paper 2 (Practical). The theory paper was worth 60% while practical paper was worth 40% of the final mark .The revised syllabus was tested for the first time with the format and weighting changed for paper 1. The format and weighting for paper 2 was the same as for the previous years.

Candidates General Performance

The table below shows candidates' overall performance for the last five years.

Table 15: Candidates' Overall Performance in Aviation Technology for the years 2008, 2009, 2010, 2011 and 2012

Year	Paper	Candidature	Maximum Score	Mean Score	Standard Deviation
2008	1		60	34.78	5.84
	2		40	26.56	2.94
	Overall	**63**	**100**	**61.33**	**7.79**
2009	1		60	34.84	6.17
	2		40	26.24	3.97
	Overall	**68**	**100**	**61.07**	**9.09**
2010	1		60	37.76	6.62
	2		40	27.21	2.94
	Overall	**52**	**100**	**63.52**	**11.1**
2011	1		60	35.49	6.51
	2		40	26.16	3.04
	Overall	**70**	**100**	**61.26**	**9.05**
2012	1		60	**34.82**	**6.63**
	2		40	**25.08**	**4.13**
	Overall	**393**	**100**	**59.90**	**9.87**

From the table above, the following observations can be made:

(i) The candidature increased from **70** in 2011 to **393** in 2012.
(ii) The candidature has been increasing consistently since 2008 except in 2010 when there was a slight drop from 68 to 52. This shows that the subject is gaining popularity amongst students and schools.
(iii) The mean score for both papers **1** and **2** dropped slightly but this may have been because of increase in candidature.

3.8.1 Aviation Technology Paper 1 (450/1)

The questions which were reported to have been poorly performed have been analyzed with a view to pointing out candidates' weaknesses and propose suggestions on some remedial measures that would be

taken in order to improve performance in future. The questions for discussions include 2, 3, 5, 6, 8, 10 and 14.

Question 2

With the aid of a labeled sketch, show the cross section of an aircraft propeller blade in flight.
Candidates were tested in the skill of sketching and labeling a cross section of an aircraft propeller blade.

Weakness

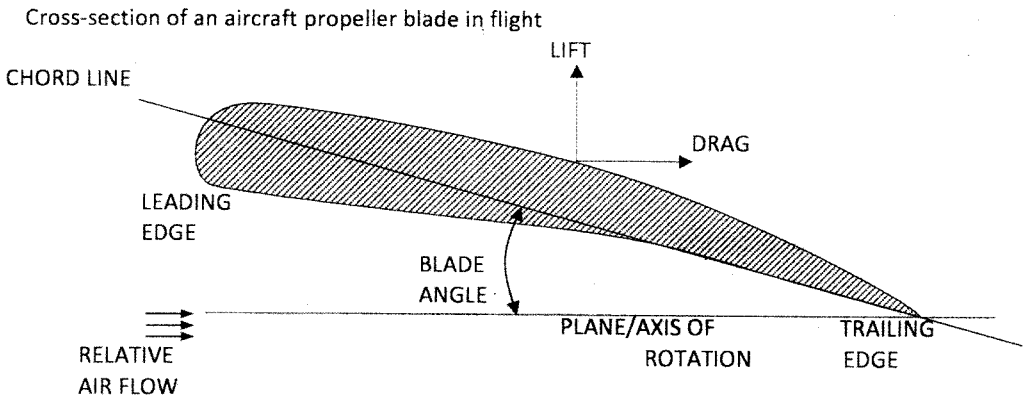
Most candidates were unable to sketch and label a cross section of an aircraft propeller blade.

Advices to teachers

They should cover the topic of propellers extensively as outlined in the syllabus.

Expected response

Cross-section of an aircraft propeller blade in flight.



Question 3 (b)

Describe **one** basic non-destructive testing method of composite structures on an aircraft

Candidates were tested on the topic; composite structures of an aircraft.

Weakness

Most candidates assumed that composite has the same meaning as any other method.

Advice to Teachers

They should teach various non-destructive methods and give examples of where each method is applied.

Expected response

Visual and coin tapping method. This is used as an elementary method to locate delamination by tapping with a coin the part being inspected and listening for debonding sound.

Question 5 (a)

List **four** ramp maintenance tasks carried out on an aircraft.

Candidates were tested on maintenance tasks on an aircraft.

Weakness

Most candidates could not answer the question.

Advice to **Teachers**

They should teach all the topics in the syllabus without assuming any.

Expected response

Four ramp maintenance tasks;

i. Servicing
ii. Engine starting
iii. Refueling or defueling
iv. Marshalling
v. Releasing the aircraft.

Question 5 (b)

State three characteristics of cirrus clouds.

Candidates were expected to state the characteristics of cirrus clouds.

Weakness

Most candidates could not answer the question which means that they did not have an idea of the answer.

Advice to Teachers

Teachers are advised to teach all the topics in the syllabus without assuming any.

Expected response

Characteristics of cirrus clouds

i. Wispy appearance
ii. Very high altitude
iii. Ice crystals
iv. Less bumpy

Question 6

Outline the working environment requirements for each of the following in the aviation industry:

i. Lighting

ii. Noise
iii. Temperature

Candidates were tested on the working environment requirements in the aviation industry.

Weakness

Most candidates confused lighting for lightening.

Advice to Teachers

They should cover more on environmental aspects in aviation industry conclusively.

Expected response

Working environment requirements
i. Lighting should be adequate.
ii. Noise should be below destruction level.
iii. Temperature must be adequate to work without discomfort.

Question 8

Draw symbol for a double pole single throw switch

Candidates were tested in drawing skills for a double pole single throw switch.

Weakness

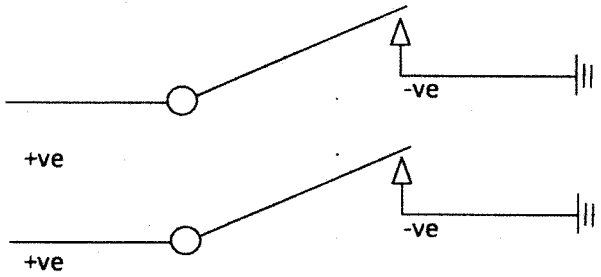
Most candidates had no idea about the question

Advice to Teachers

They are advised to cover more on electrical system requirements and the function of each system component.

Expected response

Double pole, single throw switch.



Question 8 (b)

A series Direct Current (DC) circuit has a voltage of 12 volts, resistance of 100 Ω and 12 Ω respectively.

Calculate the current flowing in the circuit.

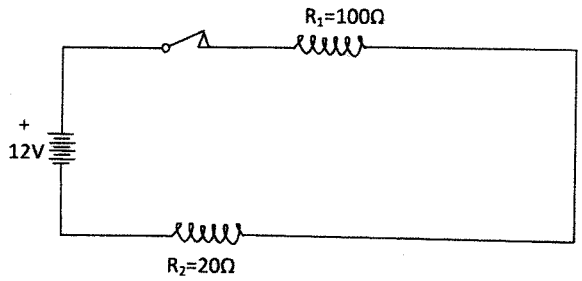
Weakness

Most candidates had no idea on how to calculate the current flowing through the circuit.

Advice to Teachers

Teachers are advised to cover the topic Electrical Systems.

Expected response



E=I(R)

$I = \frac{E}{R}$

E=12

TOTAL R=(100+20)Ω

=120Ω

$\therefore I = \frac{12}{120} = 0.1Amp$

SKETCH - 1 mark

LABELLING -1½ mark

CALCULATION- 1½ mark

(4 marks)

Question 10

State one reason for each of the following heat treatment processes:

a) Annealing
b) Case hardening
c) Normalizing
d) Tempering

Candidates were tested on heat treatment processes.

Weakness

Most candidates confused between the four processes.

Advice to Teachers

Teachers are advised to make adequate coverage of the topic Heat Treatment.

Expected response

Heat treatment processes:

a) Annealing- To produce maximum softness
b) Case hardening- To produce wear resistance surface
c) Normalizing- To produce tensile strength or remove internal stresses
d) Tempering- To reduce brittleness.

Question 14 (a)

Explain the function of each of the following elements of Instrument Landing System.

i. Localizer
ii. Glide slope
iii. Marker

Candidates were tested on the elements of Instruments Landing System

Weakness

Very few candidates got the right answer.

Advice to Teachers

They are advised to cover the topic of Navigation adequately.

Expected response

i. Localizer- The localizer provides tracking guidelines along the extend centerline of the runway. (guideline in azimuth left or right of the extended centerline)
ii. The guide slope- It provides vertical guidance towards the runway touchdown point, usually a slope of approximately 3^{o} to the horizontal.
iii. The marker- The marker beacons provide accurate range fixes along the approach (usually inner, middle and outer markers)

Question 14 (b)

Outline three sources of information received by the Radio Magnetic Indicator.

Candidates were expected to outline sources of information received by Radio Magnetic Indicator.

Weakness

Very few candidates got the right answer.

Advice to Teachers

They should cover the topic of systems adequately.

Expected response

Sources of information presented on the RM Indicator dial

i. Magnetic Heading- Heading from a remote indicating compass to a particular station.
ii. V.O.R- The bearing from a Very High Frequency Omni direction Range (VOR) ground station.
iii. A.D.F- The bearing from an Automatic Direction Funding (ADF) station.

Question 14 (c) i

State reasons for fuel cross-feeding on an aircraft.

Candidates were expected to state reasons for fuel cross-feeding on an aircraft.

Weakness

Very few candidates got the right answer.

Advice to Teachers

Teachers are advised to arrange for visits to airports or workshops for student to see the fuel systems.

Expected response

Fuel cross-feeding:

i. In case of engine failure
ii. In case of one or more tank failure
iii. Distribution of fuel for weight and balance purposes.

3.8.1 Aviation Technolofy Paper 2 (450/2)

This practical paper comprised 10 equally weighted exercises which were compulsory. The practical skills tested in this paper included the following:

(i) Sketching in good proportion an exploded view of a shimmy damping
(ii) Fabrication of a bracket shown in the figure
(iii) Identifying materials mechanical properties, type and stating their applications.
(iv) Operation of balance and Anti-balance control tabs
(v) Replacing piston rings of an engine procedurally
(vi) Interpretation of operation principle of a jet engine using Bernoulli's principle.
(vii) Exercises on navigation
(viii) Tests on Aerodrome facilities and operations
(ix) Connecting electrical circuits with different types of loads
(x) Taking measurements on a given component

Weaknesses

Although the overall performance in this paper was good, some weaknesses were noted in most of the questions as discussed below:-

In **station 1** some candidates had no idea on how the component achieves its damping function to prevent shimming.

In **station2** most candidates were not able to do the basic cutting, filing, drilling and bending in order to make the bracket as shown.

In **Station 3** candidates lacked to follow instructions while some were counting each stroke as a cycle.

In **station 4** the candidates assumed the results instead of carrying out the experiment as per the instructions.

In **station 5,** candidates in some centers used a ring squeezer to replace the piston rings.

In **station 6**, some candidates had weaknesses in interpretation of the results.

In **station 7** some candidates were not able to plot and determine bearing and type of wind.

In **station 8,** candidates in a few centers had no idea how aerodrome looks like.

In **station 9,** some candidates could not understand why the leads were of different materials and thus assume the results.

ADVICE TO TEACHERS

Teachers should ensure that all the practical aspects in the syllabus are adequately covered without assuming the support topics. The list of tools and equipment at the back of the syllabus should be used as a check list to ascertain that students are familiar with what they are expected to handle during the examination.

Students are expected to know aviation tools, parts, materials etc by the correct names. The correct handling of tools, parts, materials etc. should also be emphasized during training.

Students should be proactive in carrying out various experiments, inspecting and evaluating various aircraft components and also in setting and adjusting various parts of an aircraft.

4.8 AVIATION TECHNOLOGY (450)

4.8.1 Aviation Technology Paper 1 (450/1)

SECTION A (44 marks)

*Answer **all** the questions in this section.*

1 (a) Define the term 'Fineness Ratio' as applied in aviation industry. (1 mark)

(b) Explain the term 'Aerofoil' as applied in aircraft industry. (2 marks)

(c) Differentiate between the aircraft longitudinal and directional stability in flight. (4 marks)

2 With the aid of a labelled sketch, show the cross section of an aircraft propeller blade in flight. (6 marks)

3 (a) Outline **two** functions of wing ribs in an aircraft wing. (2 marks)

(b) Describe **one** basic non-destructive testing method of composite structures on an aircraft. (2 marks)

4 (a) List **five** rescue equipment carried on an aircraft. (2½ marks)

(b) Outline **two** safety aspects necessary to prevent foreign object damage during ground running of aircraft Jet Engines. (2 marks)

5 (a) List **four** ramp maintenance tasks carried out on an aircraft on transit. (2 marks)

(b) State **three** characteristics of cirrus clouds. (1½ marks)

6 Outline the working environment requirements for each of the following in the aviation industry:

(a) lighting; (1 mark)

(b) noise; (1 mark)

(c) temperature. (1 mark)

7 Explain why the following materials and hardware are used on an aircraft:

(a) titanium and titanium alloys; (1½ marks)

(b) round head rivets. (1½ marks)

8 (a) Draw a symbol for a double pole, single throw switch. (1 mark)

(b) A series Direct Current (DC) circuit has a voltage of 12 volts, resistance of 100Ω and 12Ω respectively.

(i) Draw and label the circuit. ($2\frac{1}{2}$ marks)

(ii) Calculate the current flowing in the circuit. ($1\frac{1}{2}$ marks)

9 Outline **four** essential informations contained in a title block on a drawing. (4 marks)

10 State **one** reason for each of the following heat treatment processes:

(a) Annealing; (1 mark)

(b) Case hardening; (1 mark)

(c) Normalizing; (1 mark)

(d) Tempering. (1 mark)

SECTION B (56 marks)

*Answer any **four** out of the following **five** questions.*

***All** questions carry equal marks.*

11 Figure 1 shows the front elevation of a truncated cone.
Draw **FULL SIZE** each of the following:

(a) the base of the cone;
(b) the front elevation
(c) development of the cone.

(14 marks)

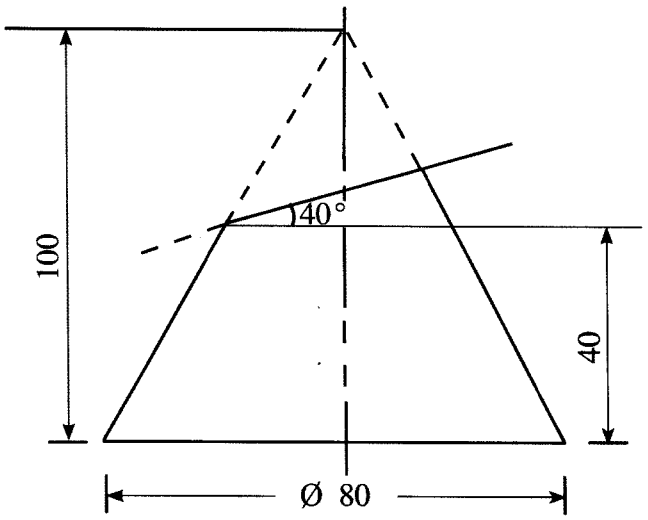


Figure 1

(Use A3 paper provided)

12 (a) Explain **four** requirements of an engineer's steel rule. (4 marks)

(b) Sketch each of the following readings:

(i) micrometer - 13.14 mm (2 marks)
(ii) vernier calliper (0.02) - 13.26mm (2 marks)

(c) With the aid of sketches, illustrate how a vernier calliper is used to measure each of the following:

(i) depth; (2 marks)
(ii) internal dimension. (2 marks)

(d) Outline **two** reasons as to why a micrometer is preferred for use over a vernier calliper. (2 marks)

13 (a) Outline **four** functions of hot gases from an aircraft gas turbine engine. (4 marks)

(b) With the aid of labelled sketches describe the construction of each of the following types of Aerogas turbine engine combustion chambers.

(i) Multiple (5 marks)
(ii) Annular (5 marks)

14 (a) Explain the function of each of the following elements of Instrument Landing System.

(i) Localizer; (1 mark)
(ii) Glide slope; (1 mark)
(iii) marker. (1 mark)

(b) Outline **three** sources of information received by the Radio Magnetic Indicator. (3 marks)

(c) (i) State **two** reasons of fuel cross-feeding on an aircraft. (2 marks)
(ii) Illustrate a typical layout of a twin engine aircraft fuel system. (6 marks)

15 (a) Explain **four** reasons for carrying out value timing on an Aeropiston engine. (4 marks)

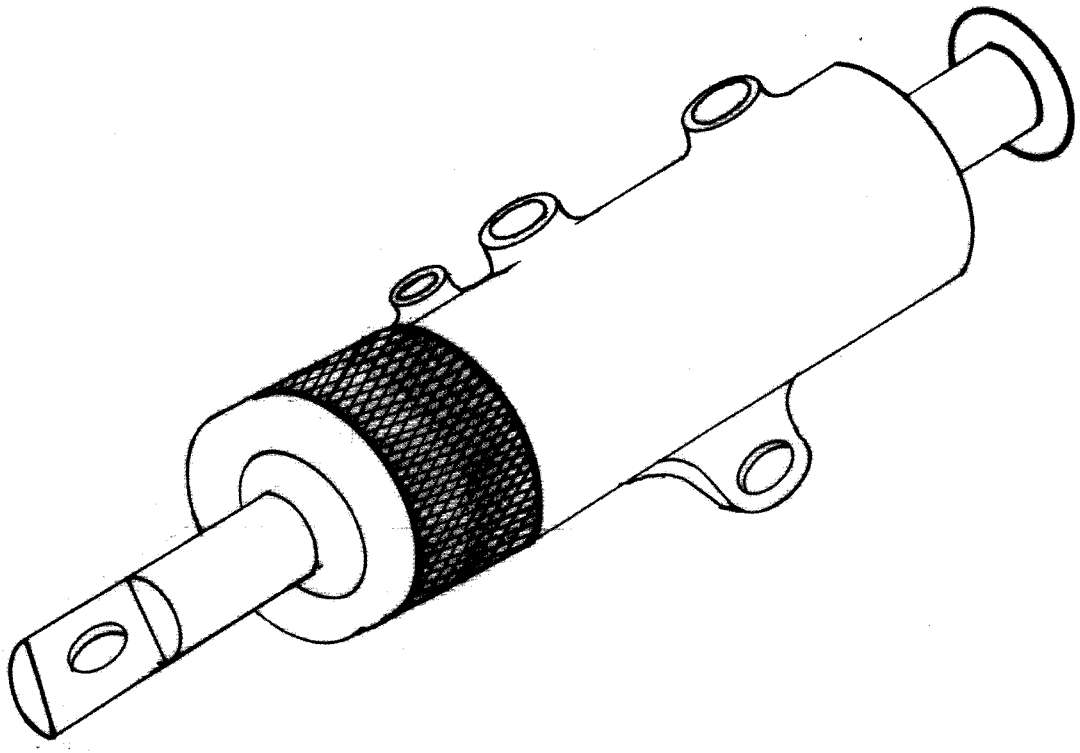
(b) Draw and label a value timing diagram of a four stroke Aeropiston engine. (10 marks)

4.8.2 Aviation Technology Paper 2 (450/2)

STATION 1

INSTRUCTIONS

The figure below shows an assembly drawing of an aircraft steering cylinder with serimmy damping provision. On the drawing paper provided sketch in good proportion the exploded view of the cylinder. Label four parts. (10 marks)



STATION 2

INSTRUCTIONS

Using the tools, materials and equipment provided make the bracket as shown in figure 1.

(10 marks)

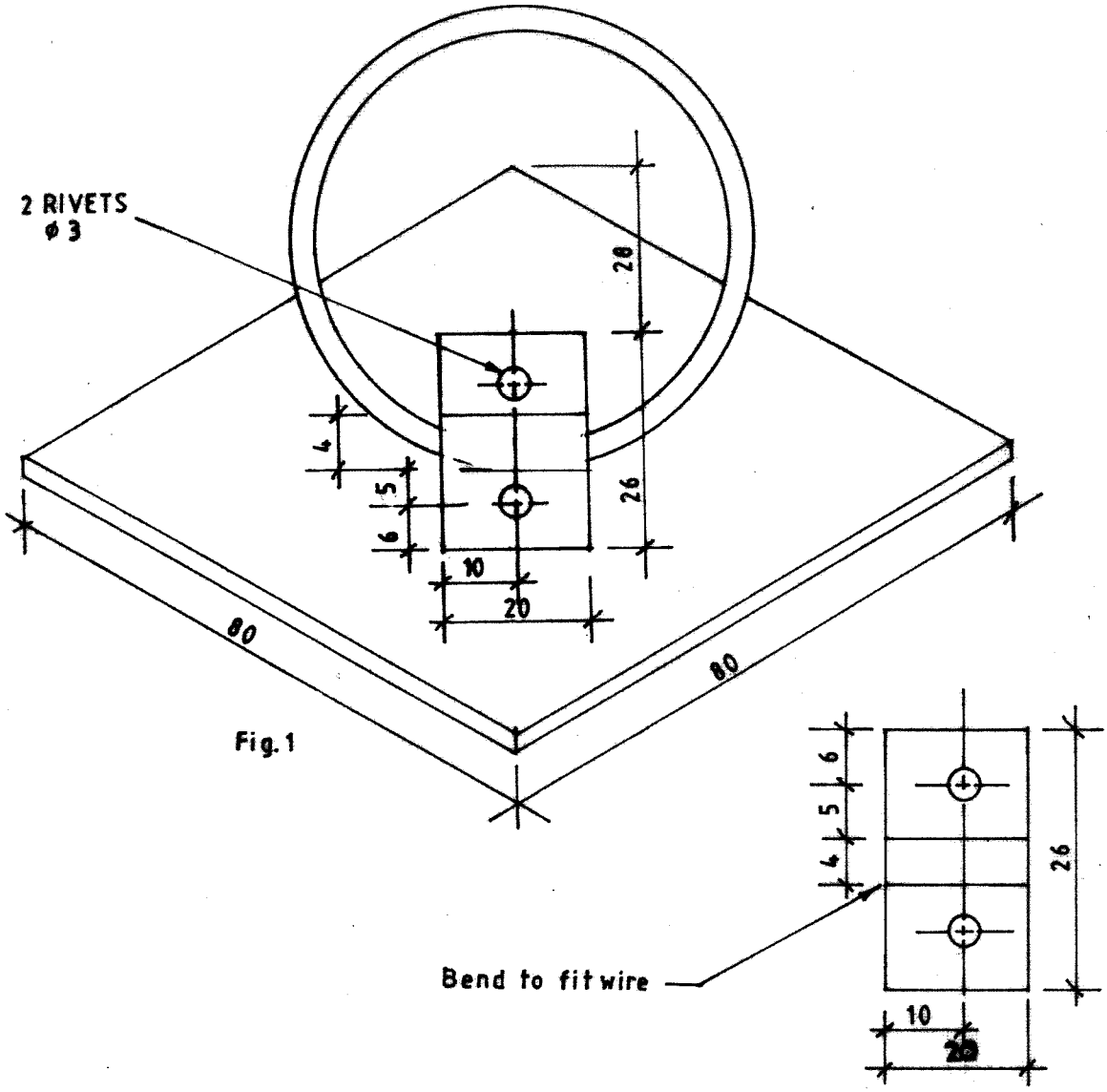


Fig. 1

STATION 3

INSTRUCTIONS

Carry out the following tasks using the materials, tools and equipment provided.

(a) Measure and mark 40mm on the strip labelled A, B, C and D.
Let the examiner check your work. (2 marks)

(b) (i) Hold the strip A at the 40mm mark in the bench vice.

(ii) Count the number of cycles to fracture by bending from maximum Left to maximum Right.

(iii) Complete the table provided for A.

(iv) Repeat the process in b(i) to (iii) for B, C and D.

Strip	No of Cycles	Mechanical Property	Material	Application
A				
B				
C				
D				

(8 marks)

STATION 4

INSTRUCTIONS

Study the model of an aircraft system provided and carry out the following:

(a) (i) Operate the part marked **J** in the forward direction and record your observations. (1 mark)

(ii) Relate your observation in a(i) to an aircraft in flight. (1 mark)

(b) (i) Operate the part marked **J** in the rearwards direction and record your observations. (1 mark)

(ii) Relate your observations in b(i) to the aircraft in flight. (1 mark)

(c) Disconnect point **P** on part **N** and connect **Q** to **H**.
Repeat (a) and (b) above and record your observations.

(a) (i) .....
(ii) .....
(2 marks)

(b) (i) .....
(ii) .....
(2 marks)

(d) (i) State the functions of **M** in (a) and (c). (1 mark)

(ii) Name the systems in (a) and (c). (1 mark)

STATION 5

INSTRUCTIONS

Using tools, equipment and parts provided demonstrate to the examiner the procedure of replacing the piston rings. (10 marks)

STATION 6

INSTRUCTIONS

Connect the set up as shown in figure 2.
Let the examiner check your work. (2½marks)

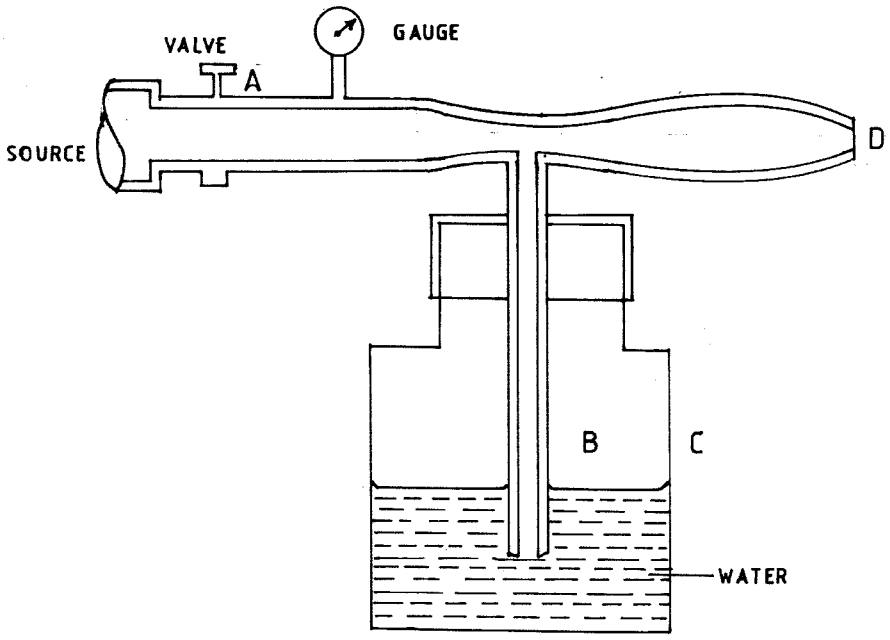


Fig. 2

(a) (i) Open valve A gradually until pressure gauge reads 5psi to 10psi and 15psi respectively and record **four** observations. (4 marks)

I. .....

II. .....

III. .....

IV. .....

(ii) State the reasons behind your observations in a(i).

(iii) Explain the principle behind your observation. (2 marks)

(b) Relate the experiment to **three** aircraft systems. (1½ marks)

(i) .....

(ii) .....

(iii) .....

STATION 7

INSTRUCTIONS

An aircraft flying from A to B at 360 knots encounters a wind 330° at 60 knots.

(a) On the map provided plot a labelled vector diagram and determine each of the following:

(i) track bearing;

(ii) type of wind;

(iii) two effects of the wind.

(8 marks)

(b) State **two** most appropriate instruments used for the navigation of the flight.

(i) .....

(ii) .....

(2 marks)

STATION 8

INSTRUCTIONS

Study the Aerodromes facilities and operations sketch attached and complete the tables below.

(a) Name the facilities marked 1, 2, 3, 4 and state the use of each. (4 marks)

Facility	**Use**
1_____	_____
2 _____	_____
3 _____	_____
4 _____	_____

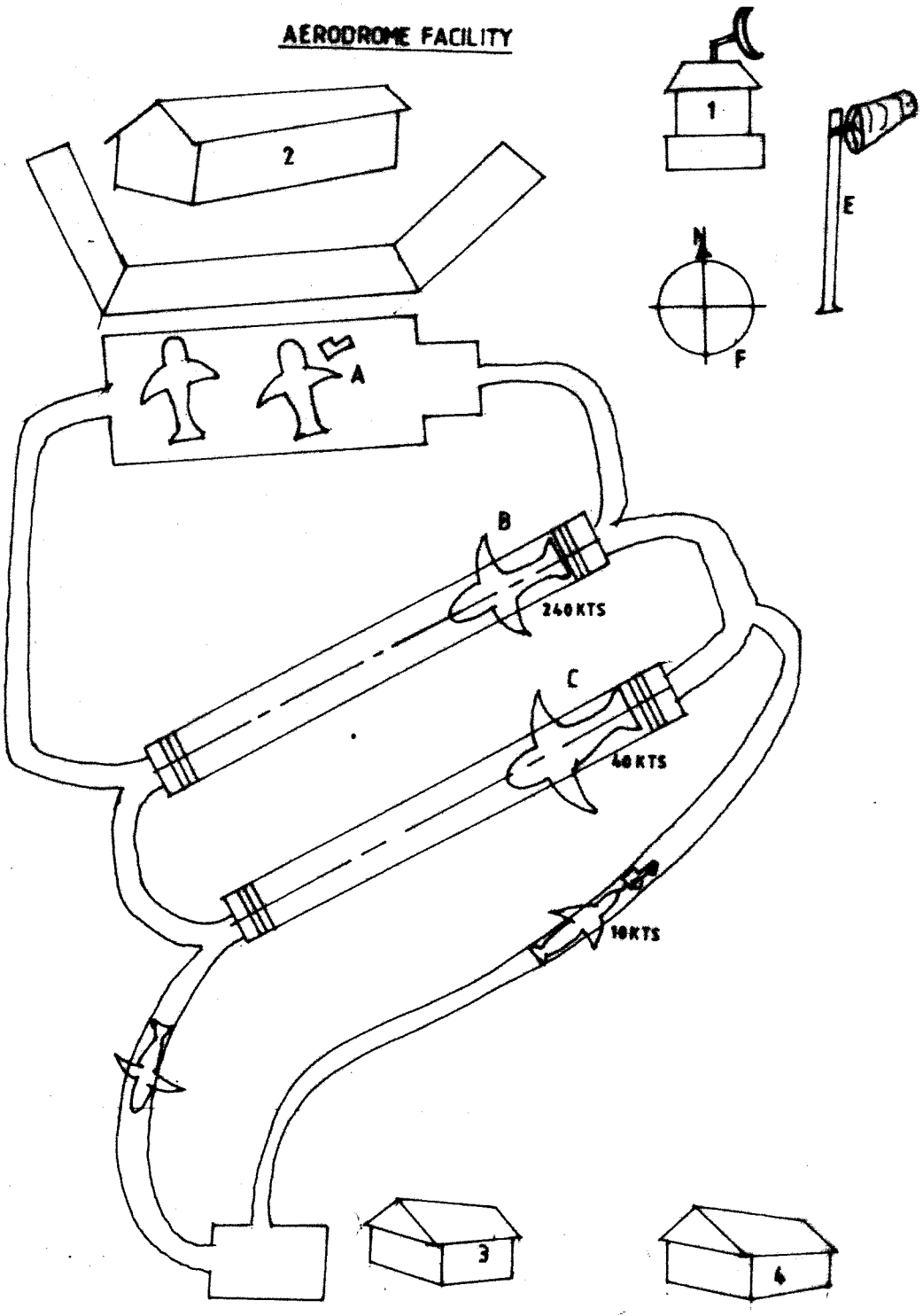
(b) Identify operational activities of the aircraft labelled A, B, C and D and state the reason for each observation. (4 marks)

Operation Activity	Reason
A_____	_____
B_____	_____
C _____	_____
D _____	_____

(c) State the function of the facility labelled E and F. (2 marks)

Facility	Function
E_____	_____
F _____	_____

STATION 8

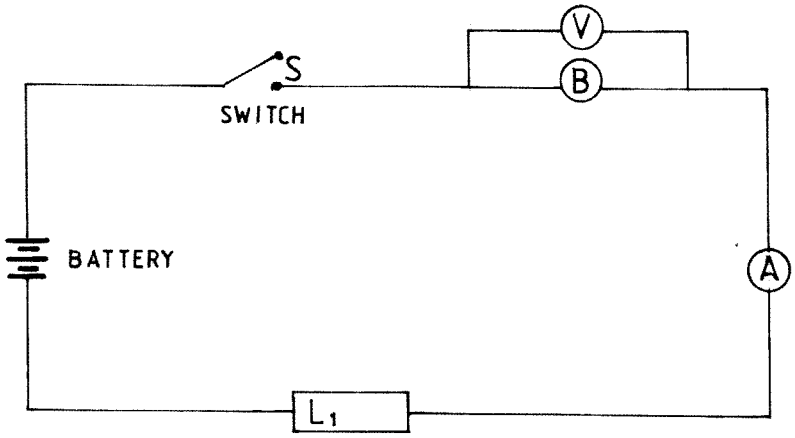


STATION 9

INSTRUCTIONS

Connect the components provided as shown in the circuit below.

Let the examiner check your work. (3 marks)



(a) (i) Select switch S, to on position and state what happens. (1½ marks)

(ii) Replace L_1 with L_2 and state what happens. (1½ marks)

(iii) Repeat a(i) with L_3 load and state what happens. (1½ marks)

(b) State **three** reasons behind your observations.

(i) .....

(ii) .....

(iii) .....

(1½marks)

(c) Relate the experiment to **two** aircraft systems.

(i) .....

(ii) .....

(1 mark)

STATION 10

INSTRUCTIONS

Using the tools, equipment and materials provided carry out the following.

(a) (i) Check and record the roundness of the bar **A** using the set-up.

(ii) Repeat a(i) for bar **B**.

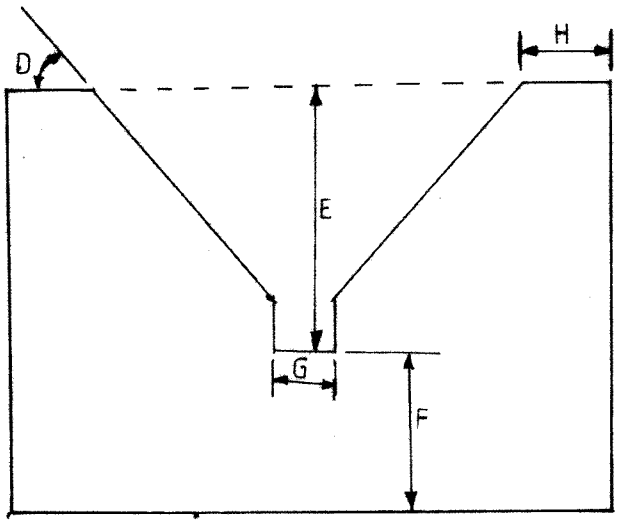
(iii) Compare the observations between the two bars.

(iv) State the reasons behind your observations.

(4 marks)

(b) Measure and record the following measurements on the Vee block on areas labelled D, E, F, G and H as shown below.

(5 marks)



VEE BLOCK

D .....

E .....

F .....

G .....

H .....

(c) State **two** safety factors to observe while using a dial test indicator. (1 mark)

5.8 AVIATION TECHNOLOGY (450)

5.8.1 Aviation Technology Paper 1 (450/1)

1. (a) Fineness Ratio is defined as the Ratio of the chordline to the thickness of the aerofoil.
(1 mark)

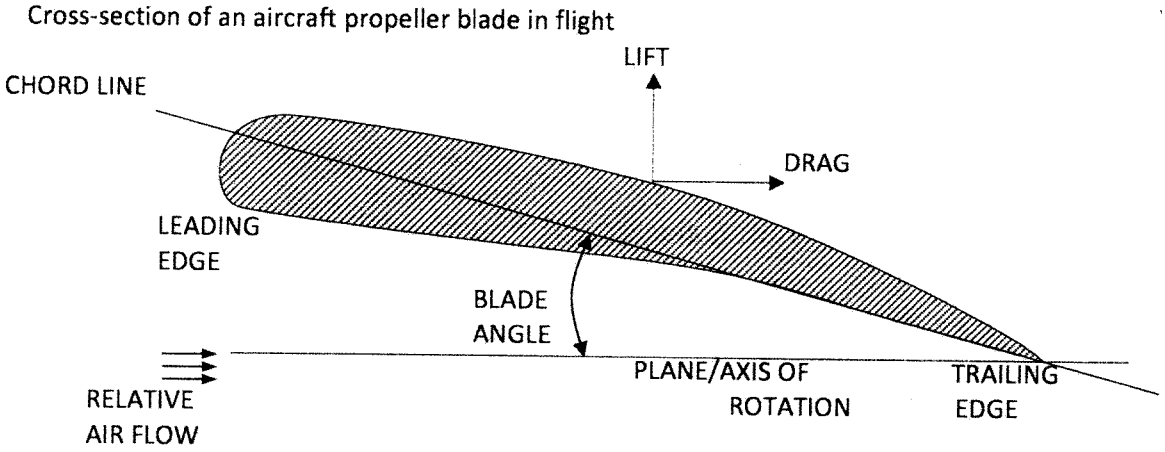
(b) Aerofoil is a device designed to produce a light reaction force when moving through a passage of air with minimum drag. (2 marks)

(c) (i) Longitudinal stability is about the lateral axis and is provided by the horizontal stabilizer.
This refers to pitch motions where the aircraft has a tendency to keep a constant angle of attack with reference to the relative wind.

while

(ii) Directional stability is about the vertical axis provided by the vertical stabilizer.
This refers to yawing motions where the aircraft attains a straight flight attitude.
(4 marks)

2. Cross-section of an aircraft propeller blade in flight.



Sketch 2 marks
Labelling any $\frac{8}{2} = 4$
6 marks

3. (a) Function of aircraft wing ribs.

(i) Give cross-section strength
(ii) Provide shape of the wing
(iii) Transfer the wing load from the covering skin to the spar.
(iv) Prevention of fuel surge to intergral fuel tanks.

Any 2 x 1 = (2 marks)

(b) Visual and coin tapping method. This is used as an elementary to locate delamination by tapping with a coin the part being inspected and listening for debonding sound.
(2 marks)

4. (a) Rescue equipment

(i) Axe
(ii) Fire extinguishers
(iii) First Aid Kit
(iv) Radio beacon
(v) Flare
(vi) Dinghy

Any 5 x $\frac{1}{2}$ = ($2\frac{1}{2}$ marks)

(b) Foreign object damage safety aspects.

(i) Ensure the engine guards are fitted.
(ii) Ensure no loose articles around.
(iii) Ensure cleanness of the running pad.
(iv) Ensure danger zones are clear.

Any 2 x 1 = (2 marks)

5. (a) Four ramp maintenance tasks:

(i) Servicing
(ii) Engine starting
(iii) Refuelling or defuelling
(iv) Marshalling
(v) Releasing the aircraft.

Any 4 x $\frac{1}{2}$ = (2 marks)

(b) Characteristics of cirrus clouds:

(i) wispy appearance
(ii) very high altitude
(iii) ice crystals
(iv) less bumpy.

Any 3 x $\frac{1}{2}$ = ($1\frac{1}{2}$ marks)

6. Working environmental requirements:

(i) Lighting should be adequate
(ii) Noise should be below destruction level
(iii) Temperature must be adequate to work without discomfort.

3 x 1 = (3 marks)

7. Materials and hardware:

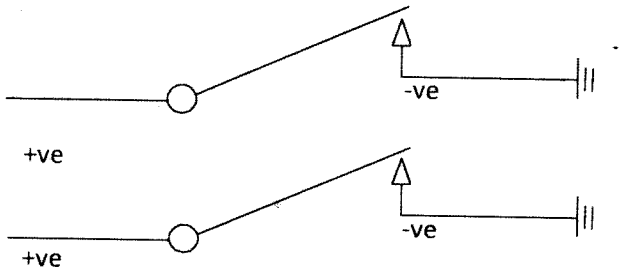
(a) Titanium and titanium alloys

(i) High melting point
(ii) Good corrosion resistance
(iii) Strength to weight ratio
(iv) Machinability

Any 3 x $\frac{1}{2}$ = ($1\frac{1}{2}$ marks)

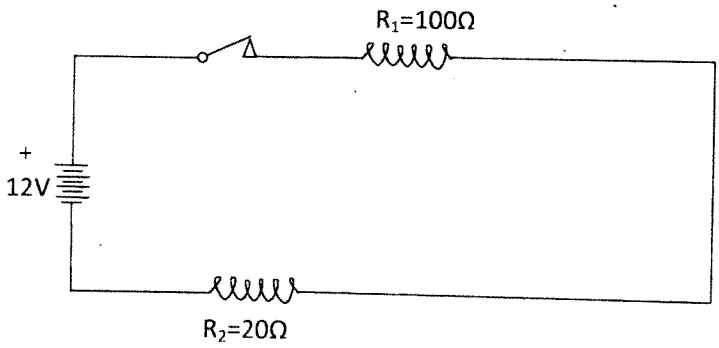
(b) Round head rivets
Round head rivets are used on internal structures where strength is a major factor and streamlining is not important.
($1\frac{1}{2}$ marks)

8. (a) Double pole, single throw switch.



(1 mark)

(b)



E=I(R)

$I = \frac{E}{R}$

E=12

TOTAL R=(100+20)Ω
=120Ω

$\therefore I = \frac{12}{120} = 0.1Amp$

SKETCH - 1 mark
LABELLING -1½ mark
CALCULATION- 1½ mark
(4 marks)

9. Title block on a drawing:

(a) Drawing number to identify the print.
(b) The name of the part or assembly (nomenclature) for filing purposes.
(c) The scale to which it is drawn.
(d) The date. When the date was done.
(e) The name of the firm.
(f) The name of the draftman and signature.

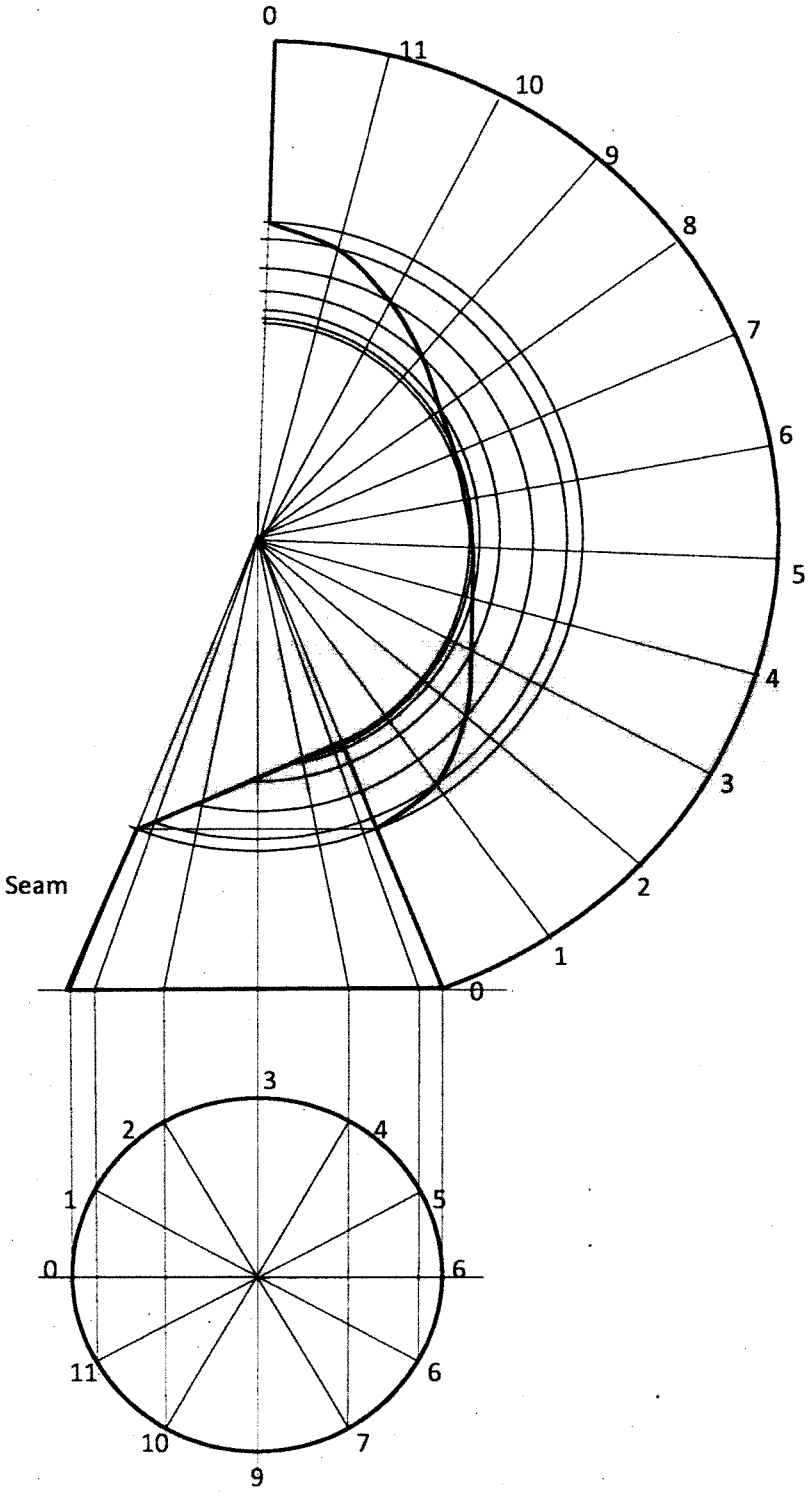
Any 4 x 1 = 4 marks

10. Heat treatment processes.

(a) Annealing - To produce maximum softness.
(b) Case hardening - To produce wear resistance surface.
(c) Normalizing - Produce tensile strength or remove internal stresses.
(d) Tempering - To reduce brittleness.

4 x 1 = 4 marks

11.



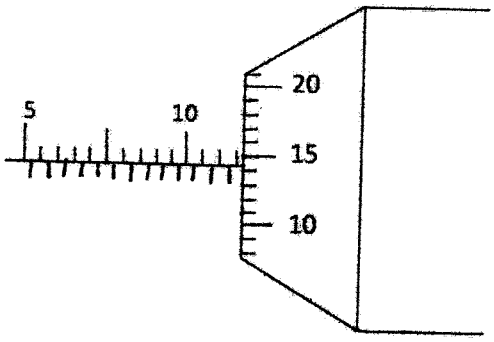
FULL SCALE	= 2 marks
LAYOUT	= 3marks
BASE	= 1mark
FRONT ELEV.	= 1mark
CONSTRUCTION	= 3marks
NUMBERING	= 1mark
DEVELOPMENT	= 2marks
NEATNESS	= 1mark
	14marks

12. (a) Engineers steel rule requirements:

(i) Made from hardened and tempered corrosion resistant spring steel.
(ii) Machine graduated so that the graduations should be precision engraved.
(iii) Ground on the edges so that it can be used to guide in scribing lines.
(iv) Ground on one edge so that it can be used as a zero datum.
(v) Chrome finished so as to remove glare.
(vi) Parallelism on the sides to give correct measurements.

Any 4 x 1 = (4 marks)

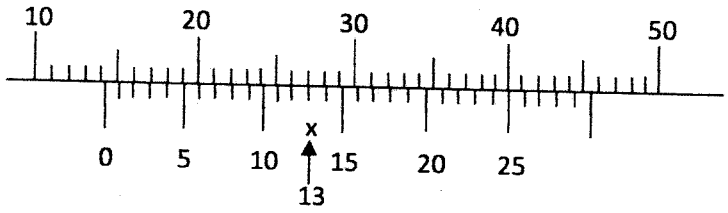
(b) (i) Micrometer reading 13.14 mm.



BARREL 13.00
0.00
THIMBLE 0.14
13.14

SKETCH =1 mark
READING =1 mark
2 marks

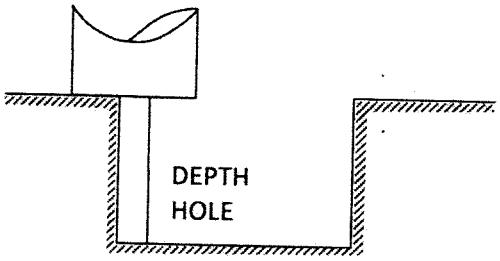
(ii) Vernier calliper (0.02) reading 13.26 mm.



13.00
13×0.02 = 0.26
13.26

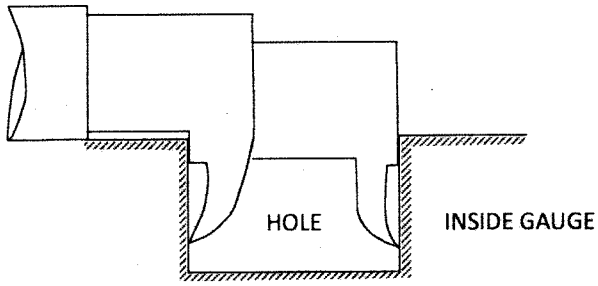
SKETCH = 1 mark
READING = 1 mark
2 marks

(c) (i) Depth measurement of a vernier calliper



Sketch -1 mark
Labelling -1mark

(ii) Internal measurement of a vernier calliper.



Sketch -1 mark
Labelling -1mark

(d) Advantages of a micrometer over a vernier calliper.

(i) Micrometer is more accurate than a vernier calliper.
(ii) Micrometer is easier to read than a vernier calliper.
(iii) Micrometer free from parallax error.
(iv) Micrometer has better feel than a vernier calliper.

Any 2 x 1 = (2 marks)

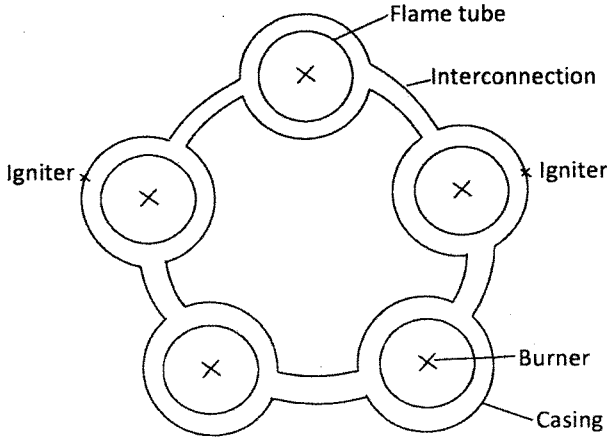
13. (a) Functions of hot gases from an aircraft gas turbine engine.

(i) To provide thrust and propel the aircraft forward.
(ii) Blown through ducts for the purpose of activating.
(iii) Blown through nozzle guide vanes for the purpose of cooling.
(iv) For the purpose of air conditioning and pressurization.
(v) For engine starting from a running engine.

Any 4 x 1 = (4 marks)

(b) (i) Types of combustion clambers for gas turbine engines.

(I) Multiple combustion chambers/cans.



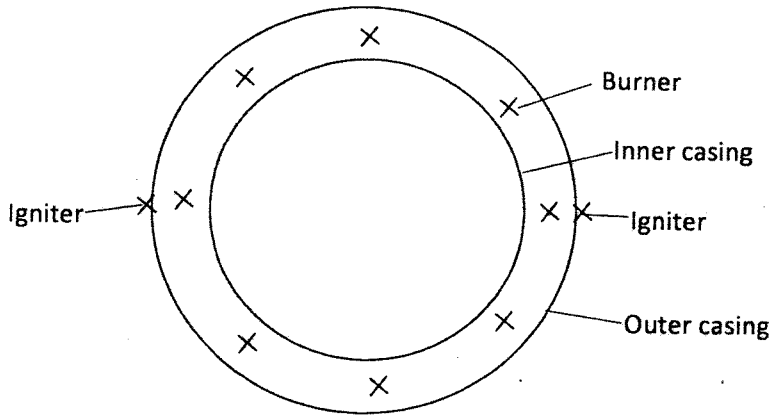
Sketch =1 mark
Labelling =2marks
3marks

This consists of chambers disposed around the engine.
Each chamber has an inner flame tube around which there is an air casing.
Each chamber has a burner.
There are two igniter plugs one on each side of the engine.
The chambers are connected with interconnectors to equalise pressures and propagate the flame during starting. (5 marks)

SKETCH	1 mark
ARRANGEMENT	1 mark
LABELLING	2 marks
DESCRIPTION	1 mark

(5 marks)

(ii) Annular combustion chamber.



This type of combustion chamber consists of a single flame tube completely annular in form, which is contained in an inner and outer casing. The burners are suspended in the annular for supplying the fuel from the fuel manifold. There are two igniter plugs, one on each side of the engine.

SKETCH	1 mark
ARRANGEMENT	1 mark
LABELLING	2 marks
DESCRIPTION	1 mark
	5 marks

(10 marks)

(14 marks)

14. (a) The function of ILS main elements:

(i) Localizer - The localizer provides tracking guidelines along the extend centreline of the runway. (guideline in azimuth left or right of the extended centreline).

(ii) The glide scope - The glidescope provides vertical guidance towards the runway touch down point, usually a slope of approximately 3° to the horizontal.

(iii) The marker - The marker beacons provides accurate range fixes along the approach (usually inner, middle and outer markers).

(3 marks)

(b) The sources of information presented on the R.M indicator dial.

(i) Magnetic Heading - Heading from a remote indicating compass to a particular station.

(ii) V.O.R - The bearing from a Very High Frequency Omnidirection Range (VOR) ground station.

(iii) A.D.F - The bearing from an Automatic Direction Funding (ADF) station.

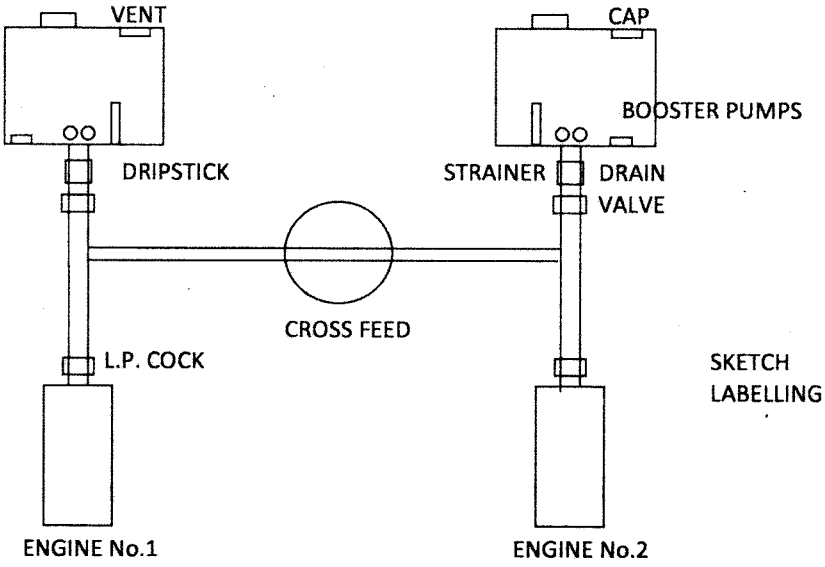
(3 marks)

(c) (i) Fuel cross-feeding

- Incase of engine failure.
- Incase of one or more tanks failure.
- Distribution of fuel for weight and balance purposes.

Any 2 x 1 = (2 marks)

(ii) Twin engine fuel system layout.



SKETCH = 2 marks
LABELLING 8×½ = 4 marks
6 marks

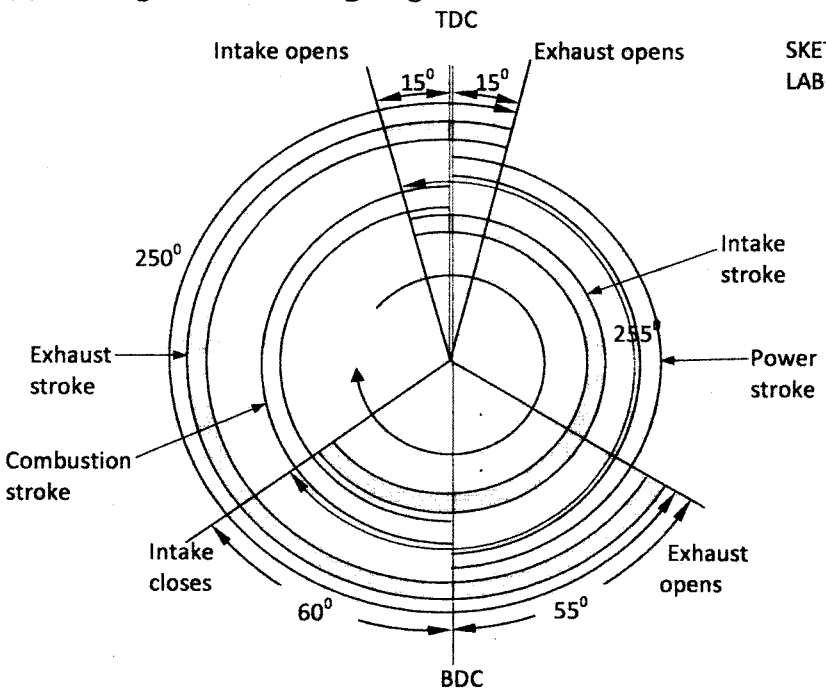
(Total = 14 marks)

15. (a) Reasons for value timing on Aeropiston engines.

(i) Improve volumetric efficiency of the engine.
(ii) Obtain maximum engine power.
(iii) Ensure ignition occurs at the right time.
(iv) To prevent backfiring and detonation.
(v) To improve the cooling of the engine.
(vi) Ensure all the burnt out gases are expelled.

Any 4 x 1 = (4 marks)

(b) Engine value timing diagram.



SKETCH = 4 marks
LABELLING 12×½ = 6 marks
10 marks

(Total = 14 marks)