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)

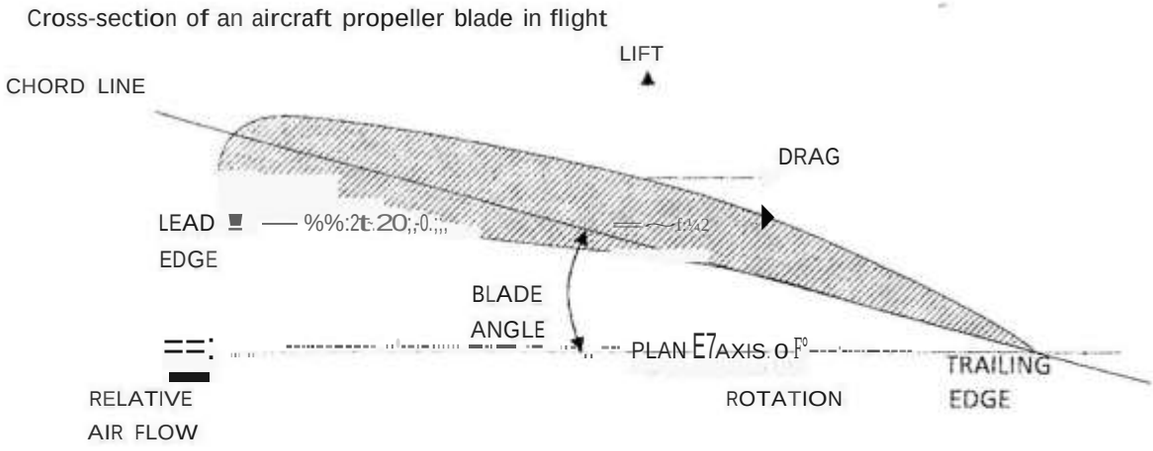
(b) Aerofoil is a device designed to produce a light reaction force when moving through a passage of air with minimum drag. (2 marks)

(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 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 = (2marks)

(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

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

Any 5 x $\frac{1}{7}$ = (2$\frac{1}{7}$ mark

(b) Foreign object damage safety aspects.

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

Any 2x1 = (2 mark

5. (a) Four ramp maintenance tasks:

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

Any 4x2$\frac{1}{2}$ = (2 mark

(b) Characteristics of cirrus clouds:

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

Any 3x7$\frac{1}{2}$ = (17$\frac{1}{2}$ **mark**

6. Working environmental requirements:

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

3x1 = (3 mark

7. Materials and hardware:

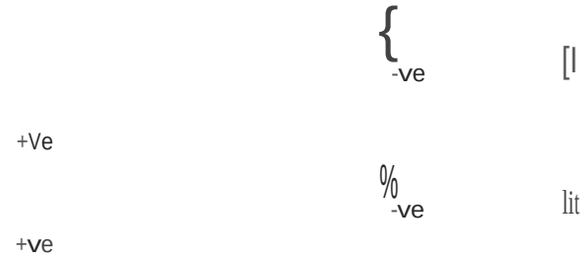
(a) Titanium and titanium alloys

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

Any 3× 1/7 = (1 1/5 marks)

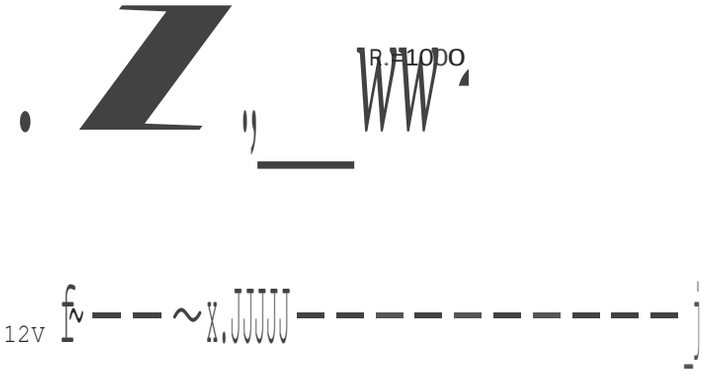
(b) Round head rivets
Round head rivets are used on internal structures where strength is a major factor and streamlining is not important. (1 1/7 marks)

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



(1 mark)

(b)



E=I(R)

E=12
TOTAL R=(100+20)0
−1200

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

Title block on a drawing:

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

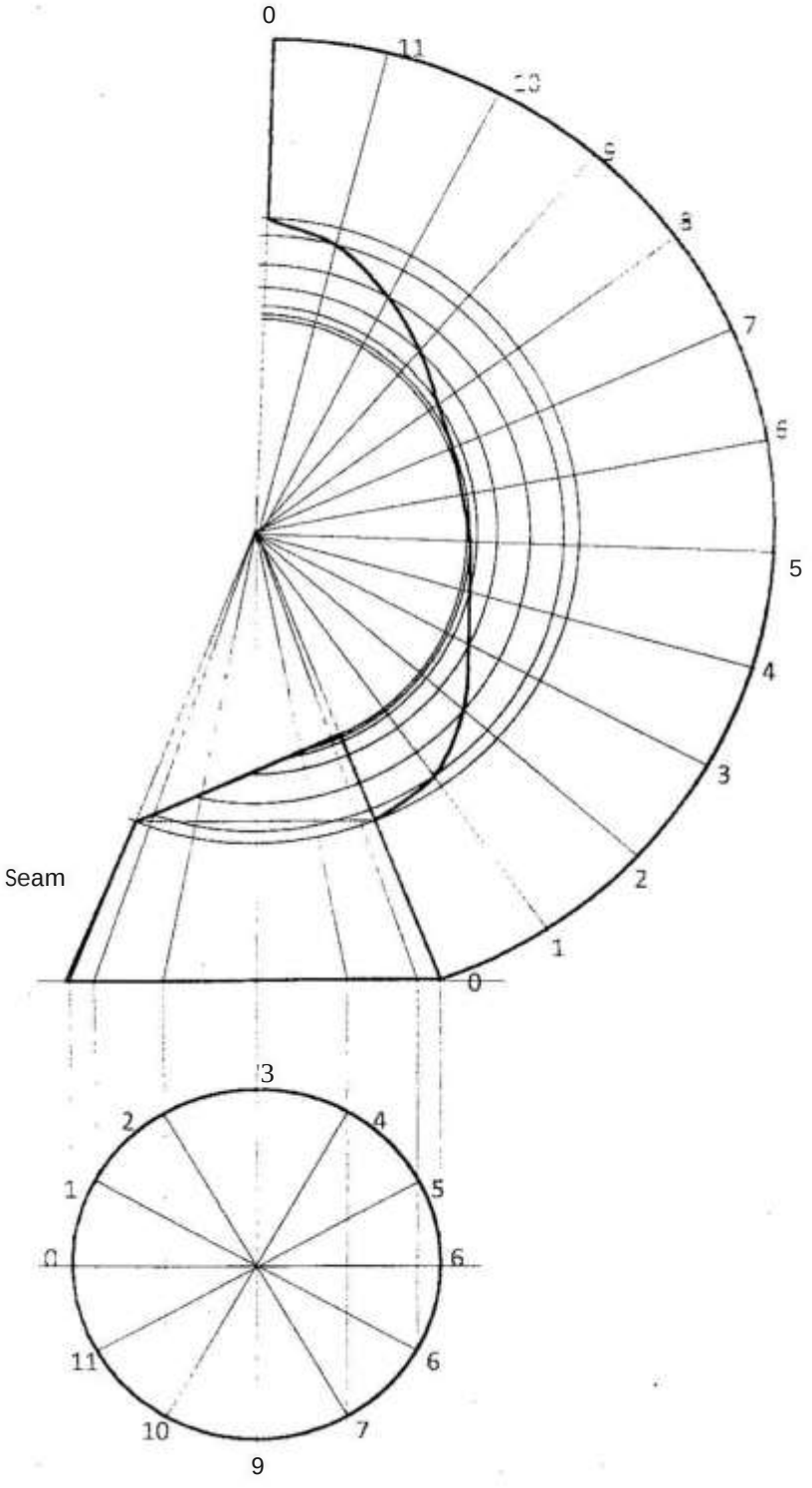
Any 4 x 1 = 4 marks

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.



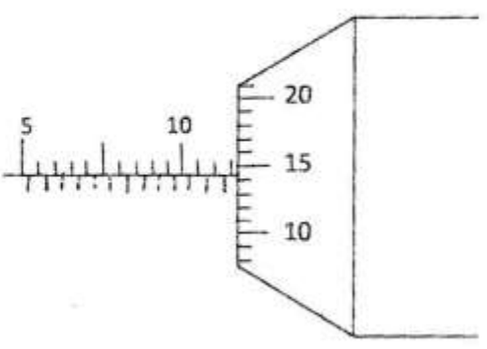
FULL SCALE	=2marks
LAYOUT	= 3marks
BASE	- 1mark
FRONT ELEV.	- 1mark
CONSTRUCTION	= 3marks
NUMBERING	= 1mark
DEVELOPMENT	= 2marks
NEATNESS	= 1mark
	14marks

12. (a) Engineers steel rule requirements:

() 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)

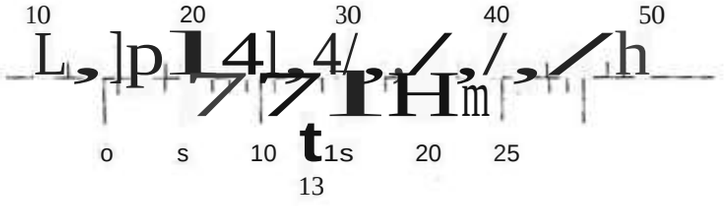
(b) () Micrometer reading 13.14 mm.



BARREL 13.00
0.00
THIMBLE 0.14
13.14

SKETCH =1 mark
READING =1 mark
2 marks

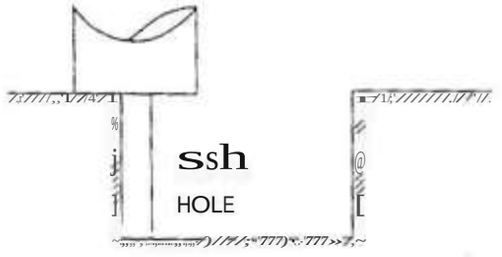
(ii) Vernier calliper (0.02) reading 13.26 mm.



13.00
13O.02 =O.26
13.26

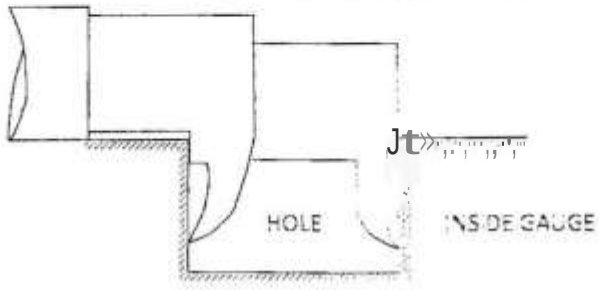
SKETCH =1 mark
READING = 1 mark
2 marks

(c) () 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

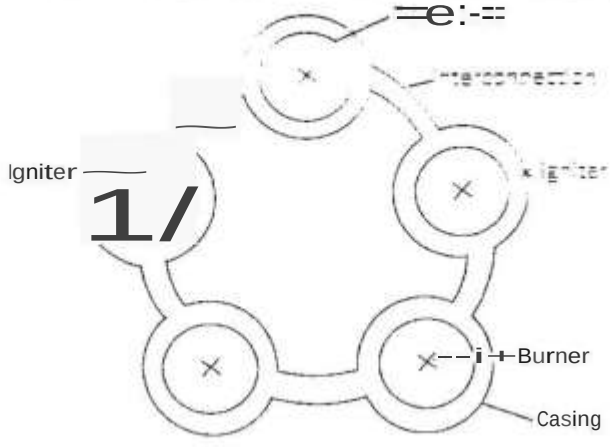
13. (a) Functions of hot gases from an aircraft gas turbine engine.

(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 4x 1 = (4 marks

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

(L Multiple combustion chambers cans.

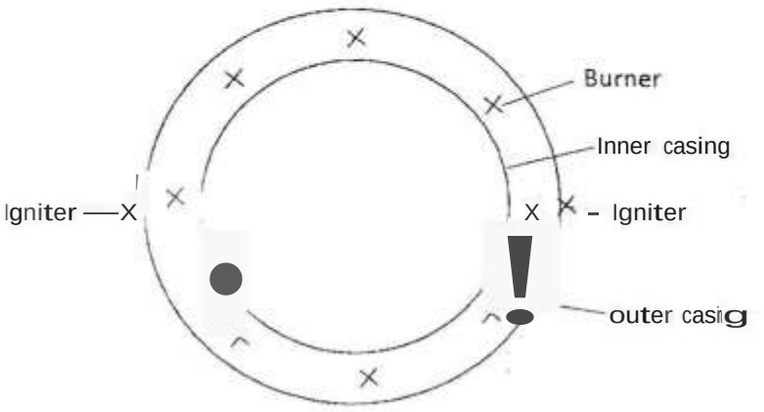


Sezc" =]mark
-ace"z =2marks
3marks

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.

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

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

(iii) AD.F - The bearing from an Automatic Direction Funding (ADP) station.

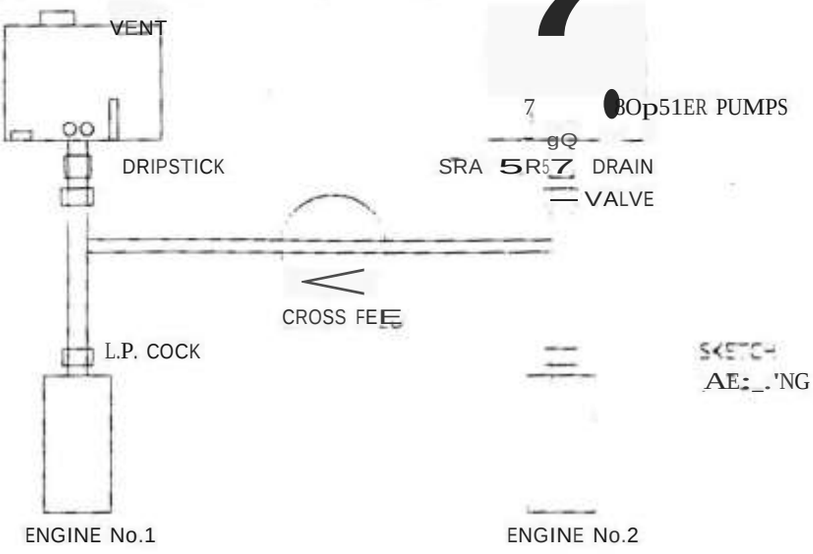
(3 marks)

·2 '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 8x% = 4 marks
6 marks

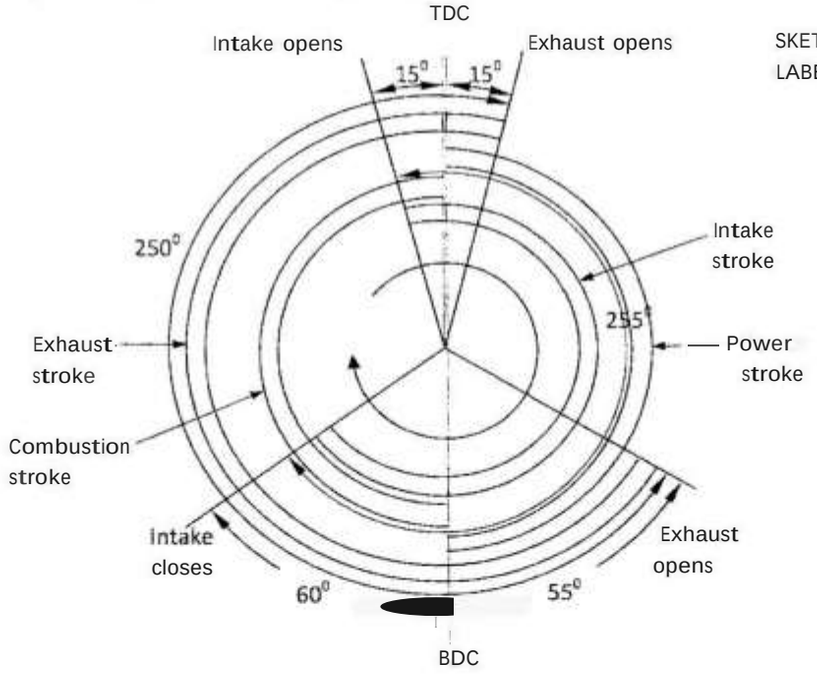
(Total = 14 marks)

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 12x% = 6 marks
10 marks

(Total = 14 marks)