

## 4.8 AVIATION TECHNOLOGY (450)



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### 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  $100\Omega$  and  $12\Omega$  respectively.
- (i) Draw and label the circuit. (2½ marks)
- (ii) Calculate the current flowing in the circuit. (1½ 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)

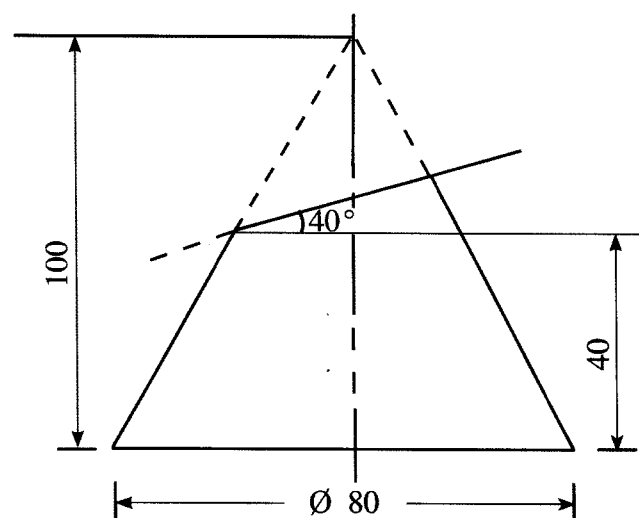


Figure 1

(Use A3 paper provided)

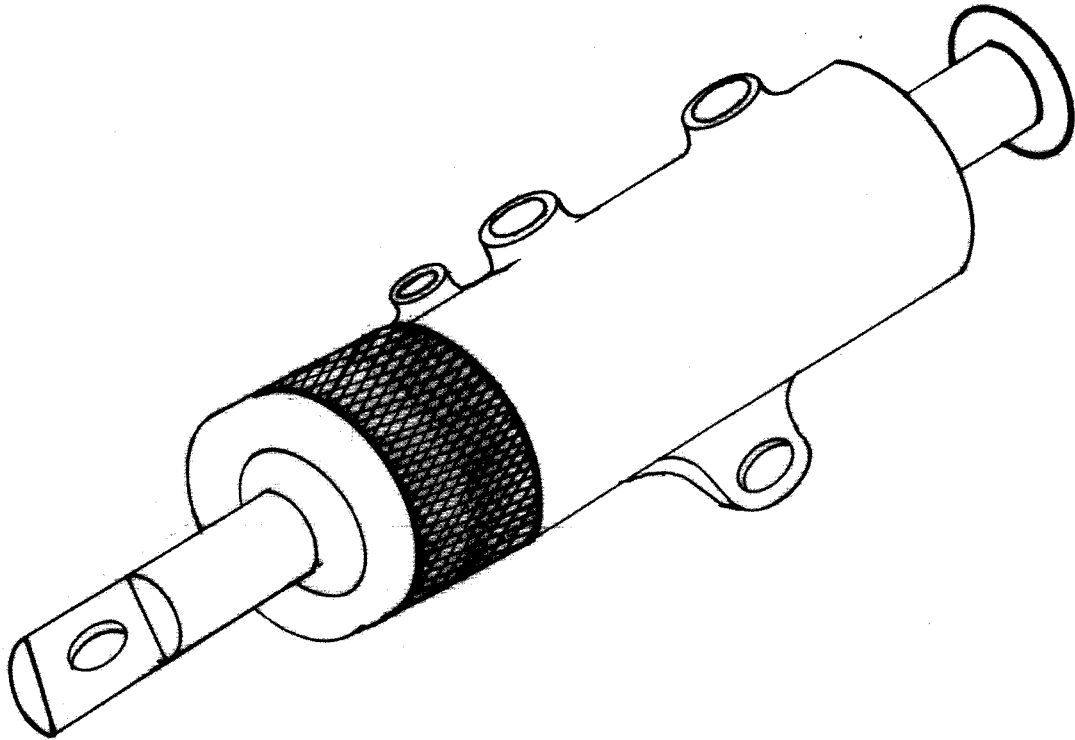
- 12** (a) Explain **four** requirements of an engineer's steel rule. (4 marks)
- (b) Sketch each of the following readings:
- (i) micrometer - 13.14 mm (2 marks)
- (ii) vernier calliper (0.02) - 13.26mm (2 marks)
- (c) With the aid of sketches, illustrate how a vernier calliper is used to measure each 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 valve timing on an Aeropiston engine. (4 marks)
- (b) Draw and label a valve 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)

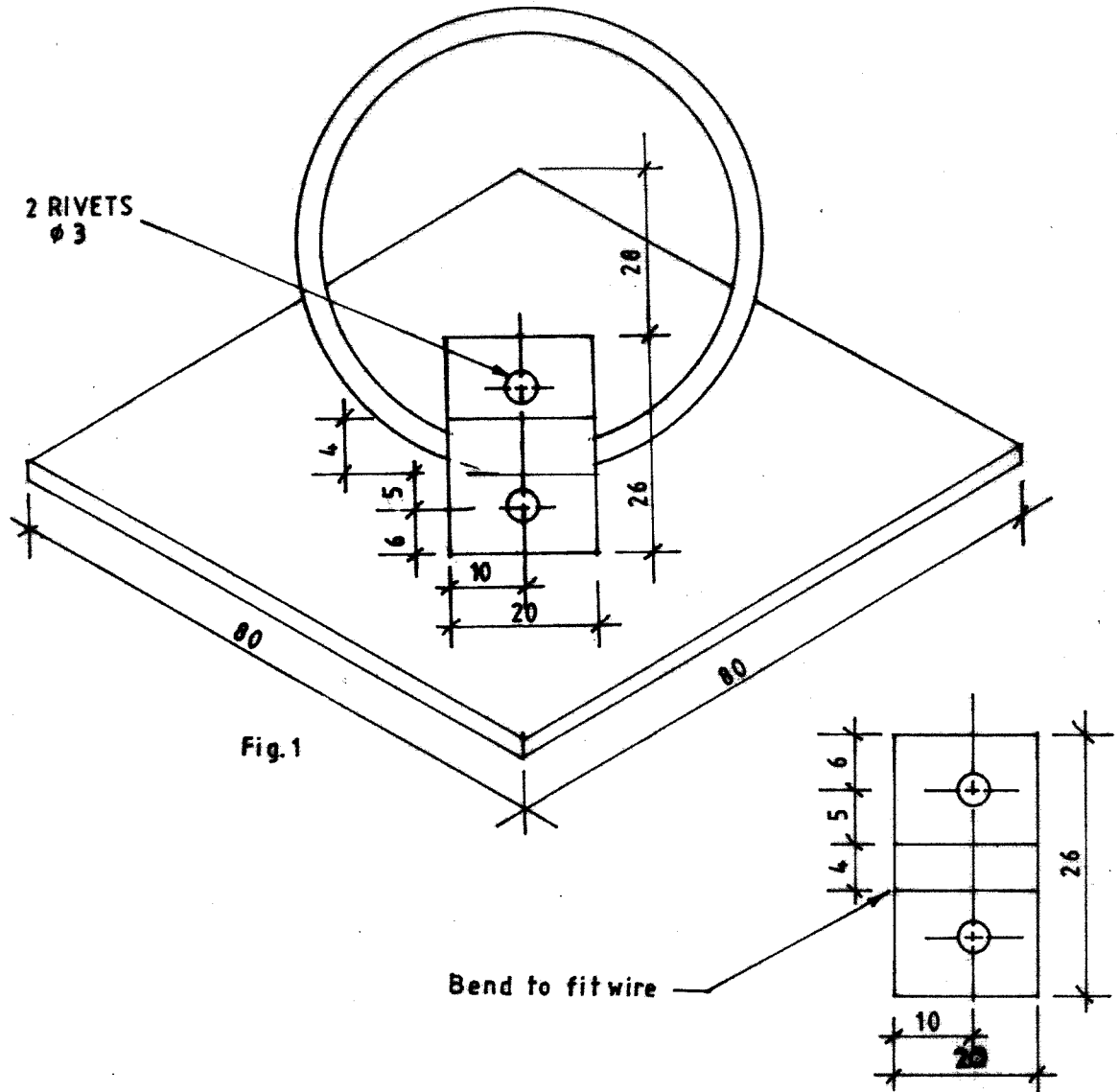


## STATION 2

### INSTRUCTIONS

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

(10 marks)



## 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. (2½ marks)

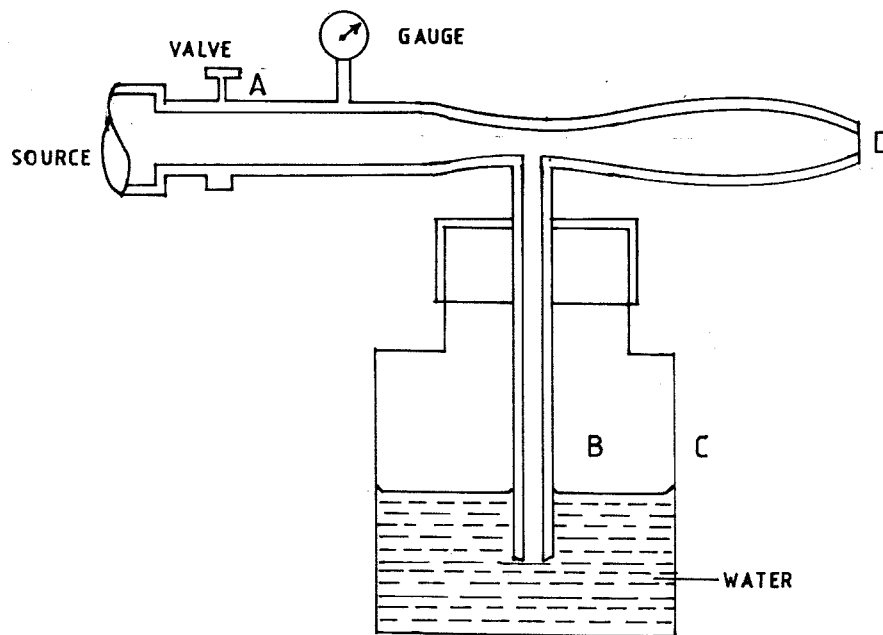


Fig. 2

- (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)

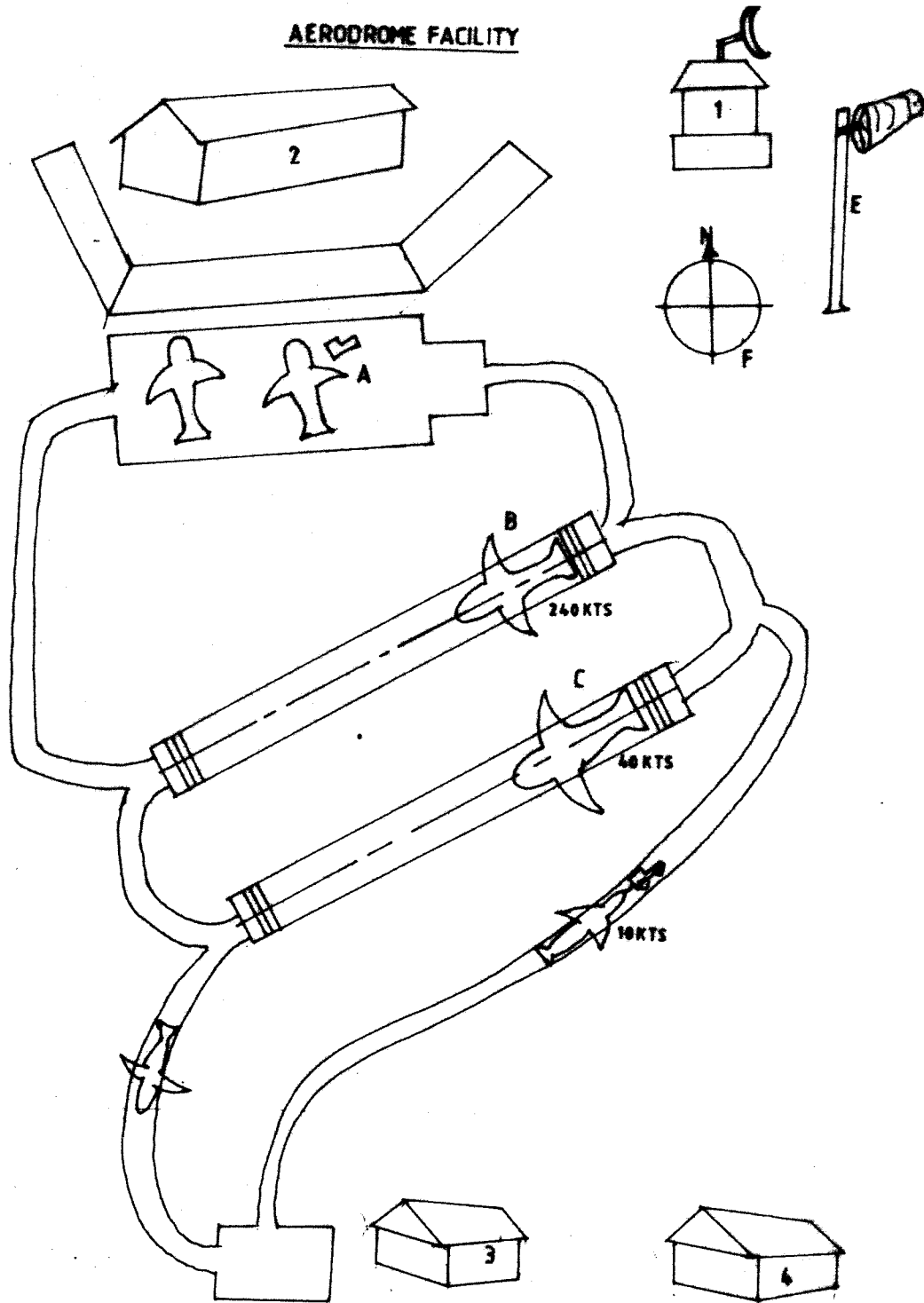
Operation Activity	Reason
A _____	_____
B _____	_____
C _____	_____
D _____	_____

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

Facility	Function
E _____	_____
F _____	_____

# STATION 8

## AERODROME FACILITY



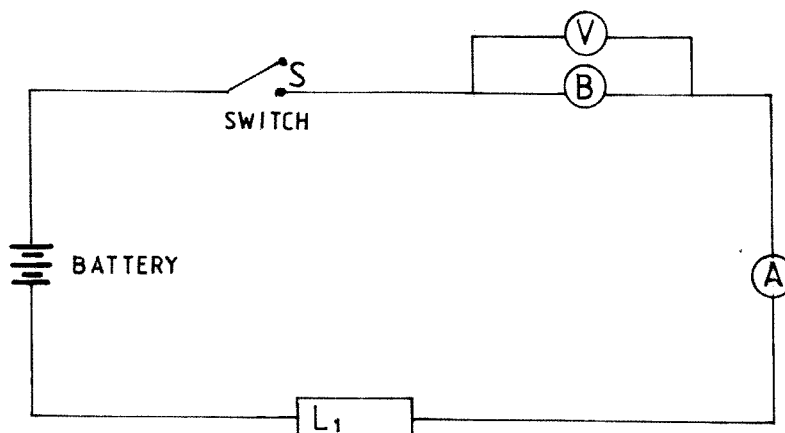
### STATION 9

#### 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<sub>1</sub> with L<sub>2</sub> and state what happens. (1½ marks)

(iii) Repeat a(i) with L<sub>3</sub> load and state what happens. (1½ marks)

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

- (i) .....
- (ii) .....
- (iii) .....

(1½ marks)

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

- (i) .....
- (ii) .....

(1 mark)

## STATION 10

### INSTRUCTIONS

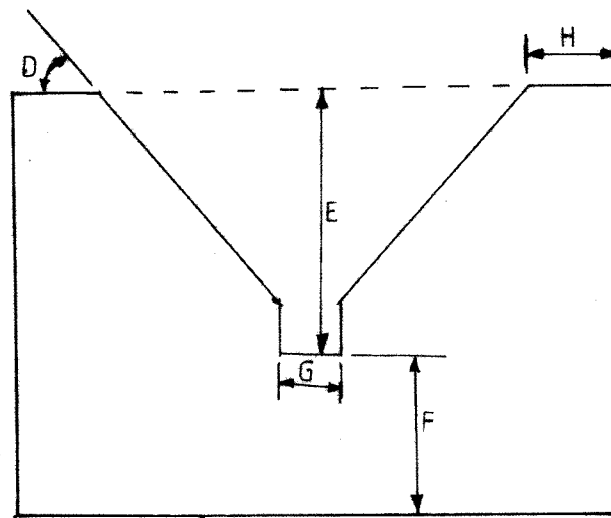
Using the tools, equipment and materials provided carry out the following.

- (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)