

**29.22 AVIATION TECHNOLOGY (450)**

**29.22.1 Aviation Technology Paper 1 (450/1)**



**MANYAM FRANCHISE**  
Discover! Learn! Apply

1. (a) SAFETY PRECAUTIONS

- Containers must be positively identified
- Bottles must be tightly clamped
- Bottles must have higher pressure than the system pressure
- Never use oil or grease
- Must be covered when not in use.

Any 4 x

(b) Parts catalogue shows a sequence of assembly and is used for ordering parts while overhaul manual guides in disassembly and reassembly of components.

2 x 1

2. GAUGES

- (a) feeler
- (b) standard wire
- (c) pitch
- (d) dial

4 x

3. DENSITY

Troposphere: very high density with maximum drag  
Stratosphere: very low with minimum drag.

TEMPERATURE

Troposphere: Temperature falls at a lapse rate  
Stratosphere: Constant temperature at  $-57^{\circ}\text{C}$

CLOUDS

Troposphere: Clouds are present  
Stratosphere: No clouds present.

3 x 1

4. (a) COMPONENTS

- |   |       |   |            |
|---|-------|---|------------|
| A | Motor | C | Transistor |
| B | Diode | D | Switch     |

4 x

(b) FUNCTIONS

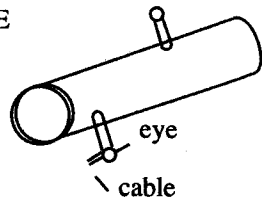
Battery serves as a power source to energize the system.

F restricts the flow of current  
G is a capacitor used to store electric energy  
H earths the circuit to avoid system interference.

4 x

5. CONTROL PARTS

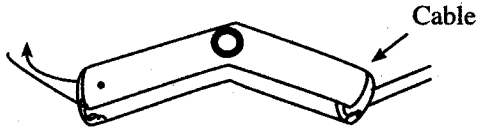
TORQUE TUBE



Transfers force from 1 point to another

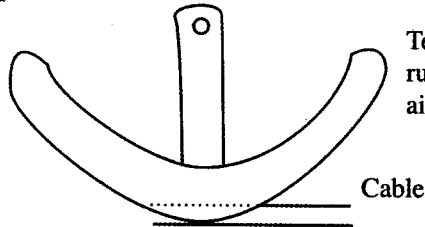
Sketch 3 x 1  
Function 3 x 1

BELL CRANK



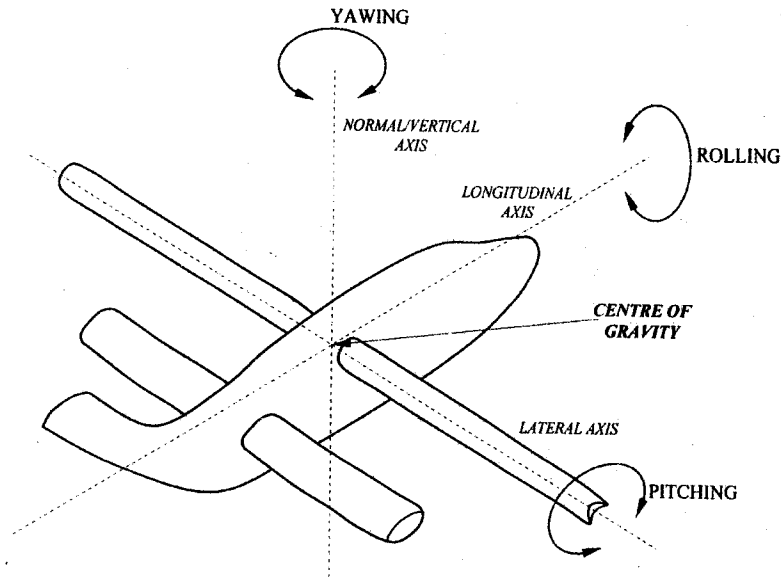
Changes direction of a force from one part to another.

QUADRANT



Tension the cable to prevent rubbing and falling to other parts of the aircraft

6. ROTATION AT AXIS



Sketching aircraft

Sketching, naming a direction of each axes (3 x ) x 3  
TOTAL 5 marks

7. SOFT SOLDERING & BRAZING

- Temperature difference
- Strength of the joint
- Difference in flux used
- Soldering is on similar metals
- Brazing is on dissimilar metals

8. MATERIALS

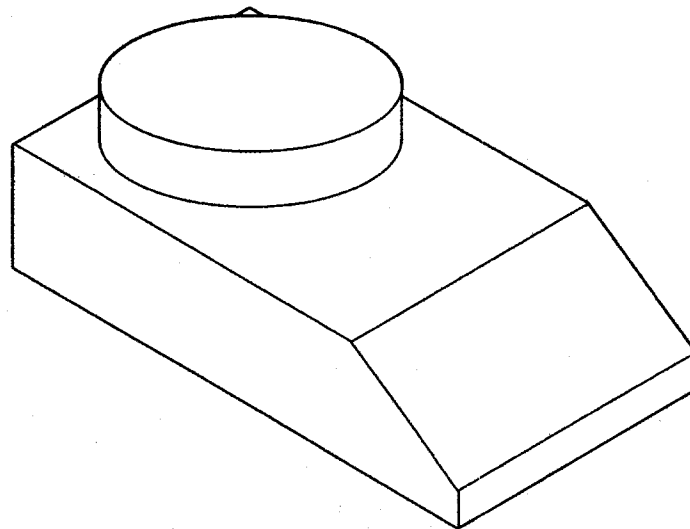
- (a) Carbon graphite is the only dry lubricant available.
- (b) Titanium retains mechanical properties even at high temperatures. It is also light and strong.
- (c) Thycol is a sealant which can withstand any solvent. 3 x 1

9. GENERATING THRUST

- (i) Acceleration of large mass of air creates a reaction which pushes/pulls aircraft forward.
- (ii) Acceleration of small mass at high velocity creates reaction which pushes aircraft forward.

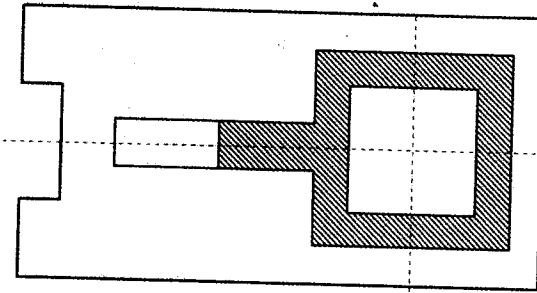
2 x 1 for explanation  
2 x 1 for appropriate sketches

10.

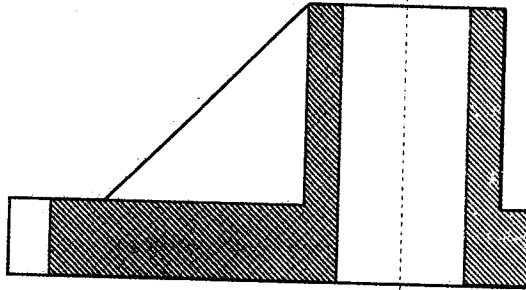


Correct faces 6 x = 3  
Isometric = 1  
A as lowest =  
Proportionality =  
5  
5 marks

11.



**SECTION Y - Y**



**SECTION X - X**

**SECTION Y-Y**

Faces (5 x 1)	= 4
Hatching (2 x 1)	= 2
Centre lines	= 1
Neatness	=
	<u>8</u>

**SECTION X-X**

Faces (4 x 1)	= 5
Hatching	= 1
Centre lines	= 1
Neatness	=
	<u>6</u>

12. (a) COMPRESSOR SECTION

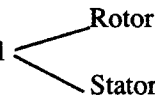
Supplies sufficient quantity of air to satisfy the requirements of combustion burners.  
Supplies bleed-air for various purposes in the engine and aircraft.

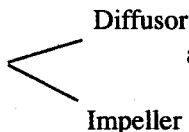
2 x 1

(b) TYPES OF COMPRESSORS

(i) Centrifugal and Axial flow 2 x ½

(ii) CONSTRUCTION

Axial  and stating what each does 2 x 1

Centrifugal  and stating what each does 2 x 1

(iii) OPERATION

Axial - correct statement about its operation

Centrifugal - correct statement about its operation 2 x 1

SKETCHES

13. (a) Hydraulic system transmits force using fluid as media while pneumatic system transmits forcing using air as a media. 2 x 1

(b) ADVANTAGES

Light in weight

Storage not required unless for emergency systems

No return lines required

Can operate at very high temperatures

Abundant in supply

Allows for leaks

Any 5 x 1

- (c)
1. Reservoir - stores the fluid
  2. Pump - build the required pressure
  3. Accumulator - stores the pressure energy when engine not running
  4. Pressure regulator - Allows passage of fluid when filter is clogged
  5. Relief valve - allow fluid return when pressure is excessive
  6. Actuating unit.

Naming 6 parts x = 3

Functions of 5 components x 1 = 5

14. (a) FLOW REGIMES

- Subsonic - speed of aircraft is below speed of sound
- Transonic - when flow of air at part of aircraft is above the speed of sound but a/c is below the speed of sound  
0.75 - 1.2
- Supersonic - when speed of a/c is above the speed of sound but a flow at the tail is below the speed of sound  
1.2 - 5.0
- Hypersonic - when entire aircraft and airflow are above the speed of sound (above 5.0) (1 x 4)

(b) AIRCRAFT BEHAVIOUR ON INCREASING SPEED

- (a) Subsonic speed  
No shock wave. Breakaway at transition point.
- (b) At critical mach number - first shock wave develops
- (c) At speed of sound - shock waves become stronger and moving back
- (d) At transonic speeds - bow wave appears from front, original wave at the tail.

correct sequence = 1  
correct sketches (4 x 1) = 4  
correct statement for each stage (4 x 1) = 4

15. (a) Vortex generators:

generates vortices to hold down the boundary layer at high speed to delay aircraft stall.

Slats:

when deployed they form slots that increase the velocity of air to hold down the boundary layer at large angle of attack to delay stall during landing and taking off.

Spoilers:

when the spoilers are raised deliberately, they break the boundary layer for quick rate of descent during pressurization failure or combat.

3 x 1

(b) **EFFECTS OF LOWERING FLAPS**

- Increases coefficient of lift by changing the shape of the wing.
- Increase the surface area thus increasing the magnitude of lift.
- Creates pitching down attitude to lower down the nose for better gliding angle.
- Increases drag to bring down the aircraft to a halt without excessive use of brakes.
- Slows down the aircraft in flight to act as speed brakes.      Any 3 x 1

(c) (i) **DOUBLE SLOTTED**

This is the type of flap when lowered increases the camber to increase the coefficient of lift and surface area of the wing and also create slots to provide spill air to hold down the boundary layer to delay stalling.

Explanation = 2  
Sketch = 1

(ii) **SPLIT FLAP**

This is the type of flap that does not move backward when lowered but only increases the coefficient of lift by changing the shape of the aircraft by increasing the camber of the main plane. When lowered fully to 45° has most drag than all the other types flaps. When lowered has nose down pitching movement.

Explanation = 2  
Sketch = 1

(iii) **ZAP FLAP**

This is the type of flap when lowered moves backwards to increase the camber and wing surface area of the wing. When lowered fully at 45° has more drag to slow down the aircraft. When lowered has nose down pitching movement.

Explanation = 2  
Sketch = 1

29.22.2 Aviation Technology Paper 2

STATION 1

Figure 1 shows an isometric view of assembled aircraft horse shoe hydraulic brake unit. On the drawing paper provided:

(a) Sketch in good proportion **seven** major breakdown parts of the assembly.

(b) Label **four** parts.

(10 marks)

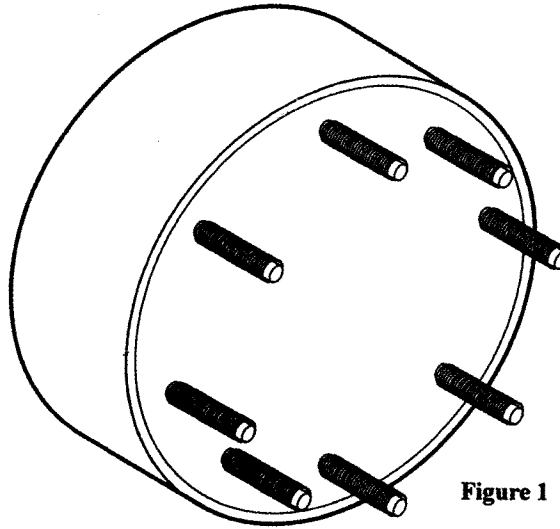


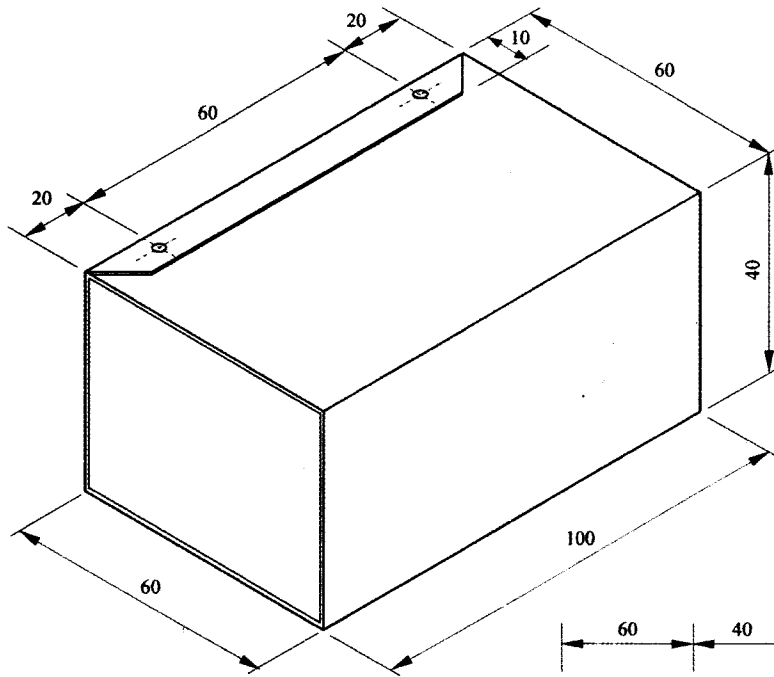
Figure 1



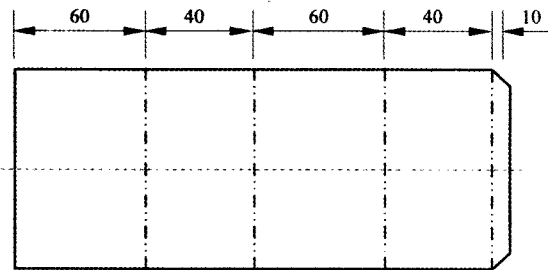
**STATION 2**

Using the tools, materials and equipment provided, make the aircraft doubler shown in figure 2.

(10 marks)



**Figure 2**



**MATERIAL**

**STATION 3**

(a) Identify the instruments labelled A to E and state the use of each instrument.

A \_\_\_\_\_

B \_\_\_\_\_

C \_\_\_\_\_

D \_\_\_\_\_

E \_\_\_\_\_

(5 marks)

(b) State the principle of operation of the instruments labelled C, D and E.

C \_\_\_\_\_

D \_\_\_\_\_

E \_\_\_\_\_

(3 marks)

(c) (i) List **two** errors associated with the instrument labelled F.

\_\_\_\_\_

\_\_\_\_\_

(1 mark)

(ii) State **two** maintenance tasks required for the instrument labelled F.

\_\_\_\_\_

\_\_\_\_\_

(1 mark)

**STATION 4**

Study the aircraft engine component labelled **G** and perform the following tasks:

- (a) Identify the component and state its use

\_\_\_\_\_

\_\_\_\_\_

(2 marks)

- (b) Name the parts labelled **H, I, J** and **K** and state the use of each.

**H** \_\_\_\_\_

**I** \_\_\_\_\_

**J** \_\_\_\_\_

**K** \_\_\_\_\_

(4 marks)

- (c) Open the cover labelled **L** and name three parts inside the chamber and state the use of each part. (3 marks)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- (d) Replace the cover and let the examiner check your work. (1 mark)

**STATION 5**

Using the tools and materials provided, make a simple model of:

- (a) rain gauge;
- (b) thermometer.

Let the examiner check your work. (10 marks)

**STATION 6**

Using the tools and equipment provided, carry out the following tasks:

- (a) Remove the exhaust valve from the cylinder head provided and identify **two** defects on the valve.

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(3 marks)

- (b) Remove the spark plug, measure and record the spark plug gap. (2 marks)

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- (c) Reassemble all the parts and let the examiner check your work. (2 marks)

- (d) State **two** methods of cooling the engine to which the cylinder head belongs and give **two** reasons for selection of the medium. (3 marks)

Cooling method 

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Reasons for medium 

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**STATION 7**

- (a) The items labelled **Q, R, S, T** and **U** are used in aircraft finishing.  
Name the items and state how each is used.

ITEM	NAME	USE
Q		
R		
S		
T		
U		

(5 marks)

- (b) Study the patch provided and:

- (i) list **six** finishing defects on the patch

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(3 marks)

- (ii) explain **two** effects on the aircraft from the defects in b(i) above.

(2 marks)

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### STATION 8

Carry out the following tasks using the materials and tools provided:

- (a) Identify the type and size of the spanner labelled **P**

TYPE \_\_\_\_\_ SIZE \_\_\_\_\_ (2 marks)

- (b) (i) Use spanner **P** to tighten the four nuts on the plate provided. (2 marks)

- (ii) Torque the nuts to 20NM using the torque wrench provided. (2 marks)

- (iii) Wirelock the nuts using the wire twister.

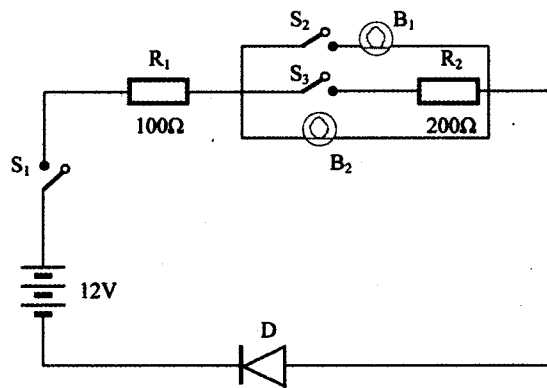
Let the examiner check your work. (4 marks)

**STATION 9**

- (a) Connect the components provided as shown in the circuit in Figure 3.

Let the examiner check your work.

(4½ marks)



**Figure 3**

- (b) (i) Select switch S1, to ON position and state what happens.

\_\_\_\_\_ (1 mark)

- (ii) Select switch S2 to ON position and state what happens.

\_\_\_\_\_ (1 mark)

- (iii) Select switch S3 to ON position and record what happens.

\_\_\_\_\_ (1 mark)

- (iv) State the reasons behind the observation in (b) (i), (ii) and (iii) above.

(1½ marks)

(i) \_\_\_\_\_

(ii) \_\_\_\_\_

(iii) \_\_\_\_\_

- (c) State two applications of the circuit in an aircraft.

(1 mark)

\_\_\_\_\_

**STATION 10**

Study the aircraft hardwares labelled **V, W, X, Y** and **Z** and in each case state:

- (a) the name of the hardware;
- (b) the appropriate tool used to fasten;
- (c) the application in an aircraft;
- (d) one defect on the hardware.

Complete the table below.

(10 marks)

HARDWARE	TOOL USED	APPLICATION	DEFECT
V			
W			
X			
Y			
Z			