

30.22 AVIATION TECHNOLOGY (450)

30.22.1 Aviation Technology Paper 1 (450/1)



MANYAM FRANCHISE
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1. (a) SAFETY PRECAUTIONS

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

Any 4 x ½

- (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 ½

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°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 ½

(b) FUNCTIONS

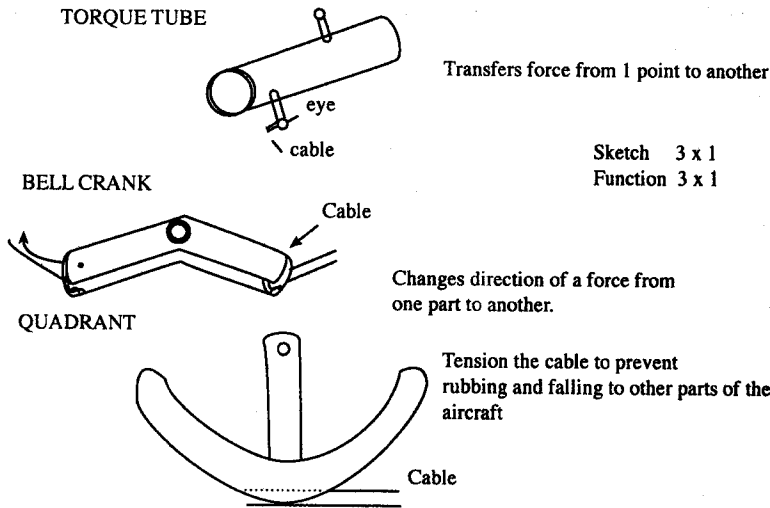
Battery serves as a power source to energize the system.

F restricts the flow of current

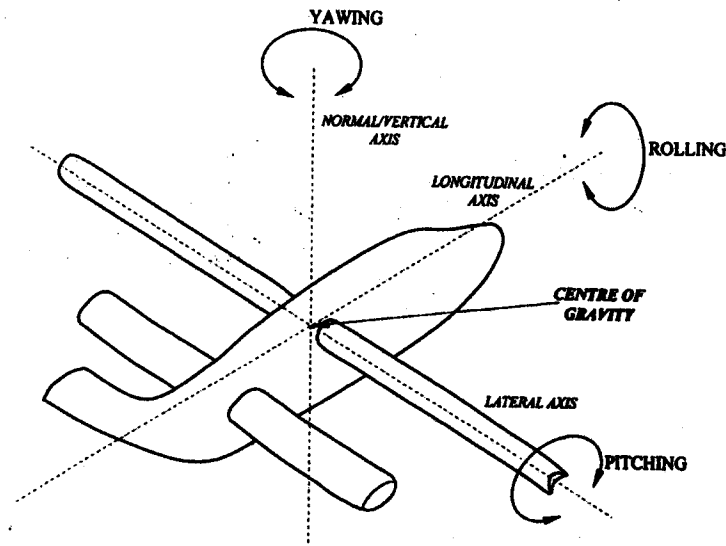
G is a capacitor used to store electric energy

H earths the circuit to avoid system interference. 4 x ½

5. CONTROL PARTS



6. ROTATION AT AXIS



Sketching aircraft ½
Sketching, naming & direction of each axes (3 x ½) 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

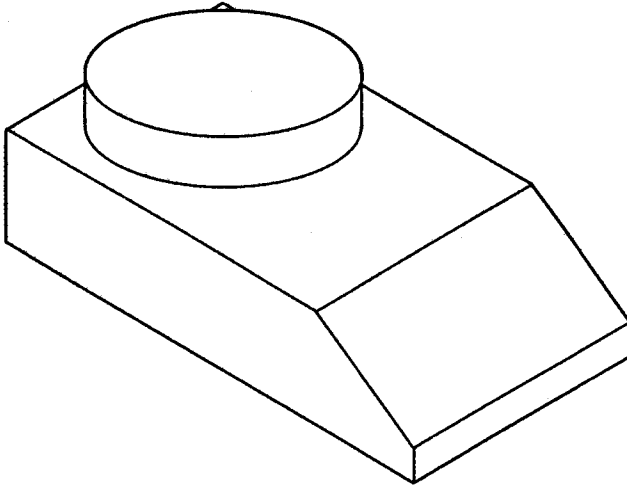
8. MATERIALS

- (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

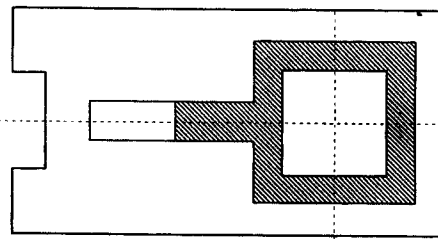
- (i) Acceleration of large mass of air creates a reaction which pushes/pulls aircraft forward.
- (ii) Acceleration of small mass at high velocity creates reaction which pushes aircraft forward.
2 x 1½ for explanation
2 x 1 for appropriate sketches

10.

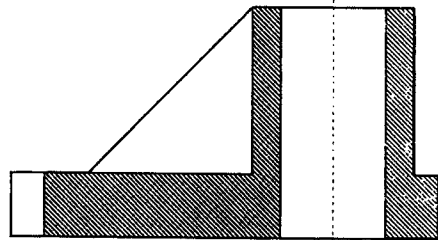


Correct faces $6 \times \frac{1}{2} = 3$
Isometric = 1
A as lowest = $\frac{1}{2}$
Proportionality = $\frac{1}{2}$
5 marks

11.



SECTION Y - Y



SECTION X - X

SECTION Y-Y	
Faces (4 x 1)	=4
Hatching (2 x 1)	=2
Centre lines (2x1)	=2
Neatness	$\frac{=1/2}{7\frac{1}{2}}$
SECTION X-X	
Faces (5 x 1)	=5
Hatching	=1
Central lines	$\frac{=1/2}{7\frac{1}{2}}$

12

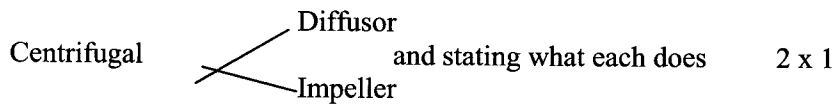
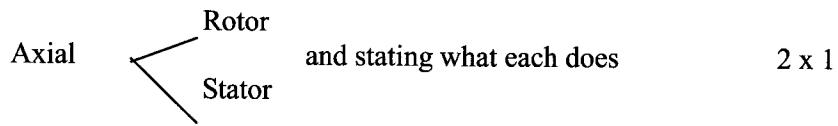
- (a) **COMPRESSOR SECTION**
 Supplies sufficient quantity of air to satisfy the requirements of combustion burners.
 Supplies bleed-air for various purposes in the engine and aircraft.

(b) **TYPES OF COMPRESSORS**

- (i) Centrifugal and Axial flow

2 x 1/2

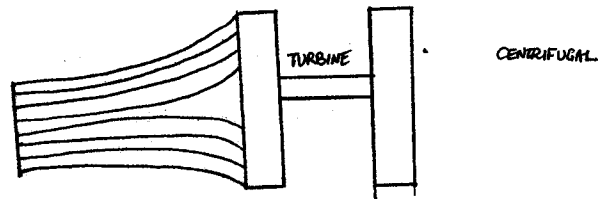
(ii) **CONSTRUCTION**



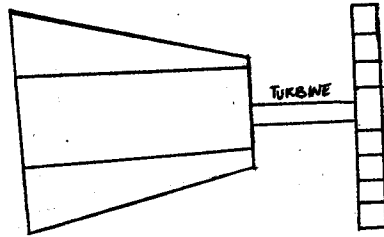
(iii) **OPERATION**

- | | |
|---|-------|
| Axial – correct statement about its operation | |
| Centrifugal – correct statement about its operation | 2 x 1 |

SKETCHES



CENTRIFUGAL



AXIAL

ANY CORRECT SKETCH 2x2
 LABELLING 4x½

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 ½ = 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) (1½ x 4)

(b) AIRCRAFT BEHAVIOUR ON INCREASING SPEED

- (a) Subsonic speed
 No shock wave. Breakaway at transition point.
- (b) At critical mack number – first shock wave develops
- (c) At speed of sound – shock waves become stronger and moving back
- (d) At transonic speeds – blow 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 held 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 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.

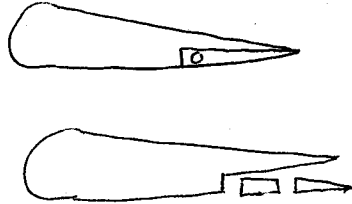
3 x 1

(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

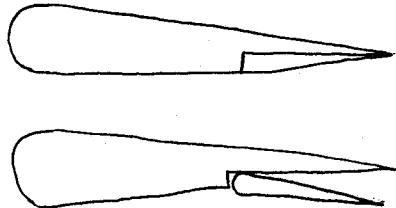
(c) (i) DOUBLE SLOTTED

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 creates slots to provide spill air to hold down the boundary layer to delay stalling.



Explanation = 2
 Sketch = 1

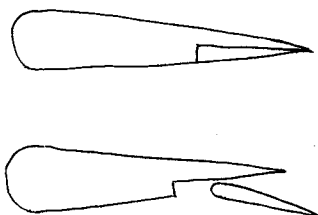
(ii) SPLIT FLAP



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 35° has nose down pitching movement.

Explanation = 2