

PRINCIPLE OF FLIGHTFILL IN THE BLANK

(1X30 MARKS)

1. An aircraft in flight is said to rotate around its Centre of gravity
2. The energy possessed by mass because of its motion is called Momentum
3. Mass is the quantity of matter in a body.
4. The energy possessed by mass because of its motion is called Kinetic Energy
5. The angle between the chord line and the longitudinal axis of the aircraft is called Angle of incidence
6. Lift coefficient is determined by Chamber of the aerofoil used
7. Drag is the horizontal component of the Total Reaction acting angles and in the same direction as the relative airflow.
8. An aircraft in flight is said to rotate around its Centre of gravity
9. Total Reaction acts through the centre of pressure which is situated on the Chord line
10. Rate of change of position is called Speed
11. The quantity of motion possessed by a body is called Momentum
12. A body designed to produce more lift than drag is called Aerofoil
13. The component of this force Perpendicular to the direction of motion is called lift
14. Lift and drags act in 90° to each other.
15. A typical aerofoil section is cambered on Top surface
16. Thrust is the force that propels an object forward.
17. A body is said to be in equilibrium when algebraic sum of all the forces acting on the body is Zero
18. A body designed to produce more lift than drag is called Aerofoil
19. Kinetic Energy is the energy possessed by mass because of its motion.
20. Velocity is a Vector quantity having both magnitude and direction.
21. A body moving along a circular path at constant speed has Acceleration
22. Power is simply the Rate of doing work
23. Weight is the force that causes objects to fall downwards.
24. Density is the mass per unit volume
25. Algebraic sum of all forces acting on the body is zero
26. The CG of an aircraft must remain within certain forward and aft limits, for reasons of both Stability and Control
27. The line joining the centre of curvature of leading and trailing edge of an aerofoil is called Chord line
28. Angle of attack is the angle between the chord line and the relative air flow undisturbed by the presence of aerofoil.
29. Newton's third law of motion states that to every action, there is an equal and opposite reaction.
30. Law of conservation of energy states that the sum total of all energy in the universe remains constant.

(5 MARKS)

Q-31 Describe Aerofoil.

Ans: Aerofoil is the shape of a wing or blade (of a propeller, rotor or turbine) or sail as seen in cross-section. An airfoil-shaped body moved through a fluid produces an aerodynamic force. The component of this force perpendicular to the direction of motion is called lift. The component parallel to the direction of motion is called drag. Subsonic flight airfoils have a characteristic shape with a rounded leading edge, followed by a sharp trailing edge, often with asymmetric camber. Foils of similar function designed with water as the working fluid are called hydrofoils.

(5 MARKS)

- Q-32 Explain the four forces acting on aircraft.**
- (a) **Lift** The vertical component of Total Reaction, resolved at right angles to the relative airflow.
- (b) **Drag** The horizontal component of the Total Reaction acting angles and in the same direction as the relative airflow.
- (c) **Thrust** It is a reaction force described quantitatively by Newton's second and third laws. When a system expels or accelerates mass in one direction, the accelerated mass will cause a force of equal magnitude but opposite direction on that system. The force applied on a surface in a direction perpendicular or normal to the surface is called thrust.
- (d) **Weight** (a) The earth exerts a certain force towards its centre on all objects on its surface. This force is called Weight of the body and is equal to the mass of the body multiplied by the acceleration due to gravity 'g'. Unit - Newton (N) - 'The force due to gravity'. ($F = m \times g$)

(5 MARKS)

Q-33 Explain Newton's Second Law of Motion.

Ans: Newton's Second Law of Motion: The rate of change of momentum of a body is directly proportional to the applied force and takes place in the direction of the application of the said force.

(5 MARKS)

Q-34 Define the following

Ans: (a) **Total Reaction** (b) **Chord Line** (c) **Angle of Attack**
(d) **Angle of incidence** (e) **Chord Length**

(f) **Total Reaction** It is one single force representing all the pressures (force per unit area) over the surface of the aerofoil. It acts through the centre of pressure which is situated on the chord line.

(b) **Chord line** It is a line joining the centers of curvature of leading and trailing edges of an aerofoil section.

(d) **Angle of attack** It is the angle between the chord line and the relative air flow undisturbed by the presence of aerofoil.

(e) **Angle of incidence** The angle between the chord line and the longitudinal axis of the aircraft.

(c) **Chord length** It is the length of chord line intercepted between the leading and trailing edges.

AERO ENGINE

FILL IN THE BLANK

(1X30 MARKS)

35. In turboprop engine, large amount of air is pushed backward by the propeller to provide **Airplane thrust**
36. Aero engine expelled the gases at a high velocity, which creates the required **Thrust**
37. The main difference between single shaft and free turbine engine is in the transmission of power to the **Propeller**
38. The operating cycle of a basic aero-engine is **Brayton Cycle**
39. In aero engine, the gas energy is produced by the combustion of **air fuel mixture**
40. Thrust is achieved by **expelling gases** at a high velocity
41. Air intake is located at the **Front** of an engine.
42. Turboshaft and turboprop engines are the examples of **Indirect reaction** propulsion.
43. There are basically **five** operating phases for any aero engine.
44. If "m" is the mass flow of gas with "v1" as inlet velocity and "v2" as outlet velocity then forward force "F" is given by $F=M(V2-V1)$
45. **Turbine** is used for expansion of combustion gas.
46. **Combustion chamber** is the place in aero engine where fuel and air-mixture is burn.
47. A great mass of air is expelled **rearwards** with a low increase of speed is the work done by a **propeller** in an aircraft.
48. Compressor is used for **compression** of air in an aero-engine.
49. Ramjets, rockets, turbojets are the examples of **direct reaction** propulsion.
50. In single shaft & free turbine engines the propellers needs to rotate at **lower RPM** than turbine
51. Brayton cycles graph consist of **pressure** and **Volume**
52. The main difference between single shaft and free turbine engine is in the transmission of power to the **Propeller**
53. **Air intake** is used to assist in induction of air.
54. Gas turbine engines are divided into two classes **Turbojet** and **Turboprop** engines.
55. In turbo prop engines the thrust is produced by **Propellers**
56. In aero engine, forward thrust is produced as per **Newton's third law of motion** of motion.
57. The principle of operation of a jet engine is similar to **piston** engine.
58. **Propulsion by action** is a type of propulsion in which a great mass of air is expelled rearwards with a low increase of speed
59. Aero engine convert one form of energy to another form to produce required **propulsion**
60. In aero engine heat energy is converted into **Mechanical Energy**
61. In case of **Jet Engine** the processes such as induction, compression, ignition and exhaust are continuous.
62. Aero engines have components mounted on the engine like **fuel pump, oil pump, vacuum pump, booster pump, generator**
63. In the field of aviation, the **heat engines** are of a great relevance.
64. Aero engines are machines which transform the **potential energy** contained in fuel and air into kinetic or mechanical energy.

Q-65 Match the Following**(5 MARKS)**

- (a) Air intake
- (b) Compressor
- (c) Combustion chamber
- (d) Turbine assembly
- (e) Exhaust assembly

- (i) Assists in induction of air
- (ii) Assists in compression of air
- (iii) Assists in combustion of fuel and air
- (iv) Assists in expansion of combustion gas
- (v) Assists in exhaust of gas

Q-66 What are the main components of an aero engine?**(5 MARKS)****Ans:** Main components of engine are:-

- (a) Air intake
- (b) Compressor
- (c) Combustion Chamber
- (d) Turbine assembly
- (e) Exhaust Assembly

Q-67 Name the various types of engine.**(5 MARKS)****Ans:** Types of engines are:-

- (i) Heat engine eg. Steam engine, piston engine, rockets etc.
- (ii) Electric Motors and Generators.
- (iii) Hydroelectric Turbines.
- (iv) Windmills

Q-68 Explain Brayton's cycle.**(5 MARKS)****Ans:** Brayton's cycle is basic thermodynamic cycle of a jet engine which shows the variation of pressure and volume.