INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

AERONAUTICAL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**FLIGHT MECHANICS**
Course Code	:	**AAEB09**
Program	:	B.Tech
Semester	:	IV
Branch	:	Aeronautical Engineering
Section	:	A&B
Academic Year	:	2019– 2020
Course Faculty	:	**Mrs.Madhurakavi Sravani, Assistant Professor** **Mrs.C.Navaneetha , Assistant Professor**

OBJECTIVES:

I	Learn the different Regimes of aircraft and performance requirements at different atmospheric conditions
II	Understand the different type of velocities and gives differences between stall velocity and maximum and minimum velocities.
III	Estimate the time to climb and descent and gives the relation between rate of climb and descent and time to climb and descent at different altitudes
IV	Illustrate the velocity and radius required for different type of maneuvers like pull-up, pull down and steady turn

DEFINITIONS AND TERMINOLOGYQUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
MODULE-I						
1	Define standard Atmosphere	The International Standard atmosphere (ISA) is a static atmospheric model of how the pressure, temperature, density, and viscosity of the Earth'satmosphere change over a wide range of altitudes or elevations. It has been established to provide a common reference for temperature and pressure and consists of tables of values at various altitudes, plus some formulas bywhich those values were derived.	Remember	CO1	CLO1	AAEB09.01
2	Define off standard atmosphere	The non standard atmosphere is known as off standard atmosphere.	Remember	CO1	CLO1	AAEB09.01
3	Define Air-data.	The data which gives airspeed, Mach number, altitude and its trends are known as air data.	Remember	CO1	CLO1	AAEB09.01

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
4	Define Air-data computers	An air data computer (ADC) is an essential avionics component found in modern glass cockpits. Thiscomputer, rather than individual instruments, can determine the calibrated airspeed, Mach number, altitude, and altitude trend data from an aircraft's Pitot-static system	Remember	CO1	CLO1	AAEB09.01
5	Define lift	Lift is the force acting perpendicular to the direction of the relative velocity. This force makes the aircraft to airborne.	Remember	CO1	CLO1	AAEB09.01
6	Define drag	Drag s the force which tries to oppose the motion, act parallel to the relative speed.	Remember	CO1	CLO1	AAEB09.01
7	Define pitching moments	The moment which try to make nose up or down called pitching moments	Remember	CO1	CLO1	AAEB09.01
8	Define center of pressure	Center of Pressure The center of pressure is the point where the total sum of a pressure field acts on a body. In aerospace, this is the point on the airfoil (or wing) where the resultant vector (of lift anddrag) acts.	Remember	CO1	CLO1	AAEB09.01
9	Define aero-dynamic center	Aerodynamic Center The resultant (or the pressure forces) also cause a moment on the airfoil. As the angle of attack increases, the pitching moment at a point (for example, the center of gravity) also changes. However, the pitchingmoment remains constant at a particularpoint, which is called the aerodynamic center	Remember	CO1	CLO1	AAEB09.01
10	What is propulsive force	The force which acts opposite to the drag and pulls the aircraft and give motion.	Remember	CO1	CLO2	AAEB09.02
11	What is EOM	EOM is Equations of the Motion, and are useful to find performance of the aircraft.	Remember	CO1	CLO2	AAEB09.02
12	Define aero-dynamic characteristic	The performance of a given airfoil profileas related to lift and drag, to angle of attac k,and to velocity, density,viscosity, compressibility, and soon.	Remember	CO1	CLO2	AAEB09.02
13	Define minimum drag speed	Minimum Drag Speed. For level flight Lift = Weight, so the required lift at the various airspeeds shouldbe constant. The speed at which minimum drag occurs is the same as the point at which maxL/D or minimum D/L occur.	Remember	CO1	CLO2	AAEB09.02
14	Define thrust specific fuel consumption	Thrust-specific fuel consumption is the fuel efficiency of an engine design with respect to thrust output. TSFC may also bethought of as fuel consumption perMODULEof thrust. It is thus thrust-specific, meaning that the fuel consumption is divided by the thrust.	Remember	CO1	CLO2	AAEB09.02
15	Define mach number.	A number representing the ratio of the speed of an object to the speed of sound in the surrounding air or medium in which it is moving.	Remember	CO1	CLO2	AAEB09.02
16	Define specific power	Thepower-to-weight ratio(Specific Power) formula for and an engine(power plant) is the powergenerated bythe engine divided by themass.	Remember	CO1	CLO3	AAEB09.03

17	Name drag reduction methods	1. Winglet, 2. Vortex generator, 3. Smoothness of the body.	Remember	CO1	CLO3	AAEB09.03
18	Define wave drag	Wave Drag is a force, or drag, that retards the forward movement of an airplane, in both supersonic and Transonic Flight, as a consequence of the formation of shockwaves	Remember	CO1	CLO3	AAEB09.03
19	Define airfoil camber	Camber is the asymmetry between the two acting surfaces of an aerofoil, with the top surface of a wing commonly being more convex. An aerofoil that isnot cambered is called a symmetric aerofoil	Remember	CO1	CLO3	AAEB09.03
20	Define chord	Chord is airfoil length while joining leading edge to trailing edge.	Remember	CO1	CLO3	AAEB09.03

MODULE-II						
S.No	**QUESTION**	**ANSWER**	**Blooms Level**	**CO**	**CLO**	**CLO Code**
1	Define range	The maximum distance travelled by an aircraft in given full fuel capacity.	Remember	CO2	CLO5	AAEB09.05
2	Define endurance	The maximum time sustained in air by an aircraft in given full fuel capacity.	Remember	CO2	CLO5	AAEB09.05
3	Define thrust	Thrust is the force produced by the engine to counter the airplane drag.	Remember	CO2	CLO5	AAEB09.05
4	Define cruise	Cruise is a flight phase that occurs when the aircraft levels after a climb to a set altitude and before it begins to descend. Cruising usually consumes the majority of a flight, and it mayinclude changes in heading (direction of flight) at a constant airspeed andaltitude.	Remember	CO2	CLO5	AAEB09.05
5	Define angle of attack	The angle between the line of the chord ofan aerofoil and the relative airflow.	Remember	CO2	CLO5	AAEB09.05
6	Define aircraft performance	Airplane performance can be defined as the capability of an airplane to operate effectively while serving a specific purpose. Among the elements of performance are takeoff and landing distances, rate of climb, ceiling,speed, payload, and fuel economy.	Remember	CO2	CLO5	AAEB09.05
7	Define wing loading	The lift produced by the wing per MODULE area is called wingloading.	Remember	CO2	CLO5	AAEB09.05
8	Define drag polar	The drag polar is the relationship betweenC the lift on an aircraft and its drag,C expressed in terms of the dependence of the drag coefficient on the lift coefficient. It may be described by an equation or displayed in a diagram called a polar plot.	Remember	CO2	CLO5	AAEB09.05
9	Define stall	The angle at which maximum lift is produced.	Remember	CO2	CLO6	AAEB09.06
10	Define flow separation	All solid objects traveling through a fluid acquire a boundary layer of fluid around them where viscous forces occur in the layer of fluid close to the solid surface.	Remember	CO2	CLO6	AAEB09.06

11	Define L/D Ratio	The ratio between the lift produced by the wing and the drag is called L/D ratio and is primary performanceparameter.	Remember	CO2	CLO6	AAEB09.06
12	Define V-speed	V-speeds are standard terms used to define airspeeds important or useful to the (In discussions of the takeoff performance of military aircraft, the term V ref stands for refusal speed	Remember	CO2	CLO7	AAEB09.07
13	Define cruise ceiling	The cruise ceiling, on the other hand, is the altitude at which the maximum climb rate is 300 fpm, though I've not seenit used much	Remember	CO2	CLO7	AAEB09.07
14	Define service ceiling	The service ceiling is the altitude at which the aircraft is unable to climb at a rate greater than 100 feet per minute	Remember	CO2	CLO7	AAEB09.07
15	Define absolute ceiling	At the absolute ceiling, there is no excess of power and only one speed will allow steady, leve l flight.	Remember	CO2	CLO7	AAEB09.07
16	Define glide distance	The distance travelled by the airplane when engine is cut off.	Remember	CO2	CLO7	AAEB09.07
17	Define density altitude	The density altitude is the altitude relative to standard atmospheric conditions at which the air density would be equal to the indicated air density at the place of observation. In other words, thedensity altitude is the air density given as a height above mean sea level.	Remember	CO2	CLO7	AAEB09.07
18	Define VS	Stall speed or minimum steady flight speed for which the aircraft isstill controllable	Remember	CO2	CLO7	AAEB09.07
19	Define VS0	Stall speed or minimum flight speed in landing configuration	Remember	CO2	CLO7	AAEB09.07
20	Define VS1	Stall speed or minimum steady flight speed for which the aircraft is still controllable in a specific configuration]	Remember	CO2	CLO7	AAEB09.07
MODULE-III						
1	Define climb	A climb is the operation of increasing the altitude of an aircraft. It is also the logical phase of a typical flight (the climb phase or climb out) following takeoff and preceding the cruise. During theclimb phase there is an increase in altitude to a predetermined level.	Remember	CO3	CLO9	AAEB09.09
2	Define descent	A descent during air travel is any portion where an aircraft decreases altitude, andis the opposite of an ascent or climb	Remember	CO3	CLO9	AAEB09.09
3	Define pitch power table	Angle of attack required for certain climb anddescentrates are dependent on variables such as gross weight, C.G. location andindicated airspeed. In relation to the produce a certain pitch attitude. Conversely, to	Remember	CO3	CLO9	AAEB09.09

4	How to decide ROCI ?	The higher you are the better your fuel efficiency, so you will want to climb quickly and then stay as high as you can until you need tostart your descent in order to land	Remember	CO3	CLO9	AAEB09.09
5	Define climb and descent angle.	The flight path angle, also referred to as the climb or descent angle, is calculated as the vertical angle between the velocity vector (i.e., where the airplane is going) and the Earth's horizon.	Remember	CO3	CLO9	AAEB09.09
6	Define best L/D	L/D max results in the lowest energy required per distance travelled and, disregarding propulsion efficiency, will give the most economical fuel consumption for long range travel. This will also give the best glide distance in unpowered flight.	Remember	CO3	CLO9	AAEB09.09
7	Define descent rate	Rate of descent is the vertical component of the aircraft's velocity, normally expressed in feet per minute. Factors affecting the descent gradient.	Remember	CO3	CLO9	AAEB09.09
8	Define rule of three	In aviation, the rule of three or "3:1 rule of descent" is that 3 miles of travel should be allowed for every 1,000 feet (300m) of descent	Remember	CO3	CLO10	AAEB09.10
9	Best ROCI	The best ROCI is predicted to be at airspeed greater than the minimum drag speed.	Remember	CO3	CLO10	AAEB09.10
10	Define steepest gradient	The steepest gradient occurs when u=1.	Remember	CO3	CLO10	AAEB09.10
11	Define minimum sink rate	Minimum sink rate is achieved by flying at minimum power speed of theaircraft. Flying at this speed will maximize the time of glideflight.	Remember	CO3	CLO10	AAEB09.10
12	Define minimum fuel climb	The minimum fuel climb will occur at the airspeed for best rate of climb.	Remember	CO3	CLO11	AAEB09.11
13	Phases of descendin g flight	Cruise flight, TMA descent, final approach.	Remember	CO3	CLO11	AAEB09.11
14	Define specific total energy	The combination of the potential and kinetic energies of aircraft, per MODULE mass, is known as the specific total energy	Remember	CO3	CLO11	AAEB09.11
15	Define Energy height	The above is sometimes called the energy height since it represents the height the aircraft would attain id all its kinetic energy were to be converted into[potential energy.	Remember	CO3	CLO11	AAEB09.11
16	Define minimu m power to takeoff.	To conform to the airworthiness, a multi engine aircraft needs to be able to climb with one engine inoperative in the takeoff configuration and exceed a minimum climb gradientrequirement.	Remember	CO3	CLO11	AAEB09.11
17	Define constraint of climb performance	The safety parameters like stalling speed, minimum control speed, noise limitations, aircraft altitudes, change of cabin pressure.	Remember	CO3	CLO11	AAEB09.11
18	Define Excess power	The difference between total available power and required power is called excess power. For having a good climb this different should be maximum.	Remember	CO3	CLO11	AAEB09.11

19	Define Descent	A descent can be produced by flying at airspeed less than the minimum drag speed.	Remember	CO3	CLO11	AAEB09.11
20	Limitation	In transport aircraft it will be undesirable	Understand	CO3	CLO11	AAEB09.11
MODULE-IV						
1	Define maneuver	Maneuver is an essential part of the mission profile, aircraft need to turn, pitch and change its airspeed to carry out its mission.	Remember	CO4	CLO13	AAEB09.13
2	Maneuver Flight	An aircraft can be said to be in maneuvering flight when its flight path is in a continuous change in state and in which there is an inertial force due to acceleration,	Remember	CO4	CLO13	AAEB09.13
3	Define linear acceleration	The linear acceleration arises from an imbalance of the forces in the direction of the flight: this may be due to excess of thrust or drag.	Remember	CO4	CLO13	AAEB09.13
4	Need of linear acceleration	The linear acceleration is employed to control the airspeed in which thrust is increased or decreased.	Remember	CO4	CLO13	AAEB09.13
5	Define maneuver envelope	The plot between loan factor and EAS is known as maneuver envelope. It gives the structural limits of the airplane.	Remember	CO4	CLO13	AAEB09.13
6	Structural boundaries	There are positive and negative structural boundaries. First occurs for +ve load factor and later due to –ve load factors.	Remember	CO4	CLO13	AAEB09.13
7	Air speed boundaries	The airspeed limits, which are defined as equivalent airspeeds, are determined by the stallboundaries.	Remember	CO4	CLO13	AAEB09.13
8	Low speed boundary	The stalling speed at which the aircraft can maintain steady state flight in a specified configuration forms lowspeed boundary.	Remember	CO4	CLO13	AAEB09.13
9	Stall buffet	The warning of the impending stall is provided solely by aerodynamic buffet. As the aircraft approaches the stall, the airflow across the upper cambered surface of the wing ceases to flow smoothly, it loses contact with the wing surface and it becomes turbulent. If the turbulent air then flows across the horizontalstabilizer, buffet results.	Remember	CO4	CLO13	AAEB09.13
10	High speed boundary	The high speed boundary is determined by the maximum structural dynamic pressure loading.	Remember	CO4	CLO13	AAEB09.13
11	The longitudinal maneuver	The longitudinal maneuver is the result of an imbalance of thrust and drag, which results in either a linear acceleration or a steady rate of climb.	Remember	CO4	CLO13	AAEB09.13
12	Specific excess power	The product of the excess thrust and the TAS per MODULE weight is known as Specific excess power.	Remember	CO4	CLO13	AAEB09.13
13	Use of excess power	Excess power can be used to increase potential energy (climb), or to increase kinetic energy (acceleration) of the aircraft.	Remember	CO4	CLO14	AAEB09.14

14	The lateral maneuver	The lateral maneuver is also known as the level turn.	Remember	CO4	CLO14	AAEB09.14
15	Stall boundary	The maximum angle of attack at which the aircraft can be flown in steady flight is limited by the stall (or stall buffet) boundary.	Remember	CO4	CLO14	AAEB09.14
16	Pull up maneuver	The pull up maneuver is a coordinated maneuver in the vertical, or pitching, plane with no rate of turn or side slip.	Remember	CO4	CLO14	AAEB09.14
17	Condition for Pull up maneuver	The load factor in the loop is not uniform and will vary with airspeed and flight path angle as the aircraft progresses around the loop.	Remember	CO4	CLO14	AAEB09.14
18	Most sustained turn	The most sustained turn that the aircraft will require to carry out in normal operations and will be flown at a speed commensurate with flight safety.	Remember	CO4	CLO14	AAEB09.14
19	Pop-up maneuver	Pop-up maneuver from low–level flight that would demand a higher rate of pitch than simple gradient changing maneuver.	Remember	CO4	CLO14	AAEB09.14
20	High ‘g’ turn maneuver	The High-G Turn is a maneuver that allows the player to make a sharper turn than normal. While the aircraft will lose a substantial amount of speed, High-G Turns can be used to effectively evade incoming missilesor enemy aircraft, or to continue pursuing an advanced enemy.	Remember	CO4	CLO14	AAEB09.14
MODULE-V						
1	Terminal phases	All conventional aircraft flight starts with the point of departure with a takeoff and end at the destination with a landing; these are known as the terminal phases.	Remember	CO5	CLO17	AAEB09.17
2	Take off phase	In the take off phase, aircraft of transferred from its stationary, ground borne state into a safe airborne state.	Remember	CO5	CLO17	AAEB09.17
3	Landing Phase	In the landing phase, the aircraft is transferred back from the airborne state.	Remember	CO5	CLO17	AAEB09.17
4	Ground run distance	The aircraft is in contact with the ground and its weight is supported by landing gear.	Remember	CO5	CLO17	AAEB09.17
5	Airborne distance	The aircraft is in transition between the ground borne state and safe air borne flight.	Memorize	CO5	CLO17	AAEB09.17
6	Engine failure accountability	The aircraft performance should be such that, at whatever time an engine fails, including during takeoff, forced landing should not be necessary. This is known as Engine failure accountability.	Remember	CO5	CLO17	AAEB09.17
7	CTO	Conventional takeoff and landing.	Remember	CO5	CLO17	AAEB09.17
8	RTOL	Reduced takeoff and landing.	Remember	CO5	CLO17	AAEB09.17
9	STOL	Short takeoff and landing.	Remember	CO5	CLO17	AAEB09.17

10	VTOL	Vertical takeoff and landing.	Remember	CO5	CLO17	AAEB09.17
11	STOVL	Short takeoff and vertical landing.	Remember	CO5	CLO17	AAEB09.17
12	Minimum control speed	An air speed below which the rudder will not be capable of producing a yawing moment large enough to provide directional control.	Remember	CO5	CLO17	AAEB09.17
13	lift off speed	The speed at which aircraft is about to leave the ground.	Remember	CO5	CLO18	AAEB09.18
14	Rotation speed	The rotation speed must allow time for the aircraft to rotate into the lift-off attitude before the lift of speed is achieved.	Remember	CO5	CLO18	AAEB09.18
15	C_L at liftoff	It's the CL of lift of which is 0.7 of $C_{Lmax.}$	Remember	CO5	CLO18	AAEB09.18
16	Minimum unstick speed	The minimum speed at which the aircraft can become airborne is known as the minimum unstick speed.	Remember	CO5	CLO18	AAEB09.18
17	Takeoff safety speed	This is the airspeed at which both a safe climb gradient and directional control can be achieved.	Remember	CO5	CLO18	AAEB09.18
18	Airborne distance	After lift-off, the aircraft is accelerated to the safe climbing speed as it is rotated into the climb.	Remember	CO5	CLO18	AAEB09.18
19	Braking distance	Once the nose wheel is on ground, the aircraft can be decelerated to a halt in the raking distance.	Remember	CO5	CLO18	AAEB09.18
20	Runway conditions	The effect of runway slope and the runway friction coefficient on the ground run distance can be accounted for by considering them as equivalent to an increase in the breaking force.	Remember	CO5	CLO18	AAEB09.18

Signature of the Faculty

Mrs.Madhurakavi Sravani, Assistant Professor **HOD, AE**