



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

AERONAUTICAL ENGINEERING

DEFINITIONS AND TERMINOLOGY

Course Name	:	ANALYSIS OF AIRCRAFT STRUCTURES
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Course Faculty	:	Dr. Y B Sudhir Sastry, Professor

OBJECTIVES

I	To help students to consider in depth the terminology and nomenclature used in the syllabus.
II	To focus on the meaning of new words / terminology/nomenclature

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
UNIT - I					
1	What are the ground loads?	All loads encountered by the aircraft during movement or transportation on the ground such as taxiing and landing loads.	Remember	CLO 1	CAAE006.01
2	What are the air loads?	Loads imposed on the structure during flight by manoeuvres and gusts.	Remember	CLO 1	CAAE006.01
3	What is surface force?	Which act upon the surface of the structure, e.g. aerodynamic and hydrostatic pressure.	Remember	CLO 1	CAAE006.01
4	What is body force?	Which act over the volume of the structure and are produced by gravitational and inertial effects.	Remember	CLO 1	CAAE006.01
4	What is wing flap?	It is providing the necessary increase of lift for take-off and landing.	Remember	CLO 2	CAAE006.02
5	What is wing?	Large surface area using to provide the lift.	Remember	CLO 2	CAAE006.02
6	What is tail plane?	Tail plane is the main contributor to directional control.	Remember	CLO2	CAAE006.02
7	What is rudder?	It is a vertical stabilizer enable the pilot to manoeuvre the aircraft and maintain its stability in flight.	Remember	CLO 2	CAAE006.02
8	What is aerodynamic centre?	Lift and drag forces acting at the point is called aerodynamic centre.	Understand	CLO 3	CAAE006.03
9	What is the basic functions of an aircraft's structure?	To transmit and resist the applied loads, to provide an aerodynamic shape and to protect passengers, payload, systems etc..	Remember	CLO 3	CAAE006.03
10	What is semi-monocoque?	Skin of the shell is usually supported by longitudinal stiffening members and transverse frames to enable it to resist bending, compressive and torsional loads without buckling.	Remember	CLO 3	CAAE006.03
12	What is monocoque?	While thin shells which rely entirely on their skins for their capacity to resist loads are referred to as monocoque.	Remember	CLO 4	CAAE006.04
13	What is the function of Ribs?	Ribs increase the column buckling stress of the longitudinal stiffeners by providing end restraint and establishing their column length.	Remember	CLO 4	CAAE006.04
14	What is the role of spar webs?	The role of spar webs in developing shear stresses to resist shear and torsional loads.	Remember	CLO 4	CAAE006.04
15	What is Rivet shear?	The rivets may fail by shear across their diameter at the interface of the plates.	Remember	CLO 4	CAAE006.04
UNIT – II					

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
1	Define a thin plate	Sheet of material whose thickness is small compared with its other dimensions but which is capable of resisting bending in addition to membrane forces.	Remember	CLO 5	CAAE006.05
2	What is pure bending?	Only moment no shear force.	Remember	CLO 5	CAAE006.05
3	What is Neutral plane?	The middle plane of the plate does not deform during the bending and is therefore a neutral plane.	Remember	CLO 5	CAAE006.05
4	What is flexural rigidity (D) of the plate?	$Et^3 / [12(1 - \nu^2)]$	Remember	CLO 5	CAAE006.05
5	What is anticlastic Surface?	Surface possessing two curvatures of opposite sign is known as an anticlastic surface.	Remember	CLO 6	CAAE006.06
6	What is synclastic surface?	synclastic surface which has curvatures of the same sign	Remember	CLO 6	CAAE006.06
7	What is tension field beam?	Flat plates which, when reinforced by horizontal flanges and vertical stiffeners, form the spars of aircraft wing structures.	Remember	CLO 6	CAAE006.06
8	What is interrivet Buckling?	The skin buckles between rivets with a wavelength equal to the rivet pitch.	Remember	CLO 6	CAAE006.06
9	What is wrinkling?	Where the stiffener forms an elastic line support for the skin.	Understand	CLO 6	CAAE006.06
10	What is complete tension field beam?	Web of the beam buckles under the action of internal diagonal compressive stresses produced by shear, leaving a wrinkled web capable of supporting diagonal tension only in a direction perpendicular to that of the buckle.	Remember	CLO 7	CAAE006.07
11	What is incomplete diagonal tension field beam?	In modern aircraft structures, beams having extremely thin webs are rare. They retain, after buckling, some of their ability to support loads so that even near failure they are in a state of stress somewhere between that of pure diagonal tension and the pre-buckling stress.	Remember	CLO 7	CAAE006.07
12	What is local instability?	In local instability the flanges and webs buckle like plates with a resulting change in the cross-section of the column.	Understand	CLO 7	CAAE006.07
13	Where Buckling occurs?	Buckling occurs when the weakest plate element, usually a flange, reaches its critical stress.	Understand	CLO 7	CAAE006.07
14	What is beam?	Any structural member subjected to transverse loads.	Remember	CLO 8	CAAE006.08
15	What is angle α ?	The angle α adjusts itself such that the total strain energy of the beam is a minimum.	Understand	CLO 8	CAAE006.08
UNIT – III					

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
1	What is open section beam?	T-, Z-, 'top-hat'-or I-sections, which are used to stiffen the thin skins of the cellular components and provide support for internal loads from floors, engine mountings, etc. Structural members such as these are known as open section beams.	Remember	CLO 9	CAAE006.09
2	What is closed section beam?	The cellular components are termed closed section beams.	Remember	CLO 9	CAAE006.09
3	What is neutral plane?	The upper fibres have been stretched and the lower fibres compressed there will be fibres somewhere in between which are neither stretched nor compressed, the plane containing these fibres is called the neutral plane.	Remember	CLO 9	CAAE006.09
4	What is neutral axis?	The line of intersection of the neutral plane and any cross-section of the beam is termed the neutral axis.	Remember	CLO 10	CAAE006.10
5	What is Hooke's law?	Law states that the stress is directly proportional to strain when external load is applied.	Remember	CLO 10	CAAE006.10
6	What is flexural rigidity of the beam?	The product EI which is known as the flexural rigidity of the beam.	Remember	CLO 10	CAAE006.10
7	What is Deflection?	The displacement of a point in between before and after application of load.	Remember	CLO 10	CAAE006.10
8	What is polar second moment of Inertia?	$I_o = I_{xx} + I_{yy}$.	Remember	CLO 10	CAAE006.10
9	What is The product second moment of area	The product second moment of area, I_{xy} , of a beam section with respect to x and y axes is defined by $I_{xy} = \int xy \, dA$.	Remember	CLO 11	CAAE006.11
10	What is shear flow q?	Shear force per unit length rather than in terms of shear stress.	Remember	CLO 11	CAAE006.11
12	What is centre of twist?	These displacements, in a loading case such as pure torsion, are equivalent to a pure rotation about some point R (x_R, y_R) in the cross-section where R is the centre of twist.	Remember	CLO 11	CAAE006.11
13	What is shear centre?	The shear loads must both pass through a particular point in the cross-section known as the shear centre.	Remember	CLO 12	CAAE006.12
14	What is Bredt-Batho theory?	The theory of the torsion of closed section beams is known as the Bredt-Batho theory.	Remember	CLO 12	CAAE006.12
15	What is Bredt-Batho formula?	$T = 2Aq$.	Remember	CLO 12	CAAE006.12
16	What is Neuber beam?	Closed section beam for which $pR^{Gt} = \text{constant}$ does not warp and is known as a Neuber beam.	Remember	CLO 12	CAAE006.12
UNIT - IV					
1	What is boom?	Replace the stringers and spar flanges by concentrations of area, known as booms.	Remember	CLO 13	CAAE006.13

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
2	What is Aircraft skin?	Skin is effective only in shear	Remember	CLO 13	CAAE006.13
3	What is complex structures consisting of thin sheets of metal stiffened by arrangements of stringers?	These structures are highly redundant and require some degree of simplification or idealization before they can be analyzed.	Remember	CLO 13	CAAE006.13
4	How shear force flows in fuselage?	A fuselage section is basically a single cell closed section beam. The shear flow distribution produced by a pure torque.	Remember	CLO 13	CAAE006.13
5	What is cut-out?	In practice it is necessary to provide openings in these closed stiffened shells for, for example, doors, cockpits, bomb bays, windows in passenger cabins.	Remember	CLO 13	CAAE006.13
6	What is wing sections?	wing sections consist of thin skins stiffened by combinations of stringers, spar webs, and caps and ribs.	Remember	CLO 13	CAAE006.13
7	What is Fuselage?	The central body portion of an aircraft designed to accommodate the crew and the passengers or cargo.	Remember	CLO 14	CAAE006.14
8	What is stringer?	A longitudinal structural piece in a framework, especially that of a ship or aircraft.	Remember	CLO 14	CAAE006.14
9	What is longeron?	Longeron or Stringer is a thin strip of wood or metal, to which the skin of the aircraft is fastened.	Remember	CLO 14	CAAE006.14
10	What is stiffener?	The aircraft structural panel including any attached stiffeners is a system of parts interacting with each other as they are acted upon by combinations of pressures and in-plane as well as bending loads.	Remember	CLO 15	CAAE006.15
11	What is bulkhead?	Transverse frames which extend completely across the fuselage are known as bulkheads.	Remember	CLO 15	CAAE006.15
12	What is The efficiency of a joint?	Actual failure load with that which would apply if there were no rivet holes in the plate.	Remember	CLO 16	CAAE006.16
13	What is limit load?	The maximum load that the aircraft is expected to experience in normal operation	Remember	CLO 17	CAAE006.17
14	What is proof load?	Proof load, which is the product of the limit load and the proof factor.	Remember	CLO 17	CAAE006.17
15	What is ultimate load?	The product of the limit load and the ultimate factor (usually 1.5).	Remember	CLO 18	CAAE006.18
UNIT - V					
1	What is Wing spar?	The spar is often the main structural member of the wing, running span wise at right angles.	Remember	CLO 19	CAAE006.19
2	What is box beam?	Box beams are hollow wood / metal beams, three or four sided structures built to replicate solid beams.	Remember	CLO 19	CAAE006.19

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
3	What is tapered wing?	A trapezoidal wing is a straight-edged and tapered wing planform. It may have any aspect ratio and may or may not be swept.	Remember	CLO 19	CAAE006.19
4	What is tapered wing spar?	Spars with tapered <i>cross section</i> .	Remember	CLO 19	CAAE006.19
5	What is open sections beam?	The cross section of thin walled beams is made up from thin panels connected among themselves to create open cross sections of a beam (structure). Open sections include I-beams, T-beams, L-beams, and so on.	Remember	CLO 19	CAAE006.19
6	What is Closed Section beam?	The sidewalls are continuous all around whether it be a pipe or a square or a rectangular member.	Understand	CLO 19	CAAE006.19
7	What is wing?	Which is capable of flight using wings that generate lift caused by the aircraft's forward airspeed and the shape of the wings.	Remember	CLO 19	CAAE006.19
8	What is bending?	Any structural member deflects when it is subjected to external loads.	Remember	CLO 19	CAAE006.19
9	What is torsion?	The action of twisting or the state of being twisted, especially of one end of an object relative to the other.	Understand	CLO 20	CAAE006.20
10	What is shear?	Shear stress arises from the force vector component parallel to the cross section of the material.	Remember	CLO 20	CAAE006.20
11	What is tapered wing?	<i>Tapered wing</i> with straight leading and trailing edges.	Understand	CLO 20	CAAE006.20
12	What is deflection?	The degree to which a structural element is displaced under a load.	Remember	CLO 20	CAAE006.20
13	What is principle of stiffener?	Longitudinal web stiffeners, which are aligned in the span direction.	Remember	CLO 20	CAAE006.20
14	What is Landing gear?	Landing gear is the undercarriage of an aircraft or spacecraft and may be used for either takeoff or landing.	Remember	CLO 20	CAAE006.20
15	What is tricycle landing gear of aircraft?	Tricycle gear is a type of aircraft undercarriage, or landing gear, arranged in a tricycle fashion.	Remember	CLO 20	CAAE006.20

Signature of the Faculty

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