INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

AERONAUTICAL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**EXPERIMENTAL AERODYNAMICS**
Course Code	:	**AAE509**
Program	:	**B.Tech**
Semester	:	**III**
Branch	:	**AeronauticalEngineering**
Section	:	**A, B & C**
Academic Year	:	**2018– 2019**
Course Faculty	:	**Dr. P K Mohanta, AE**

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 TERMINOLOGYQUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	UNIT-I FUNDAMENTALS OF EXPERIMENTS IN AERODYNAMICS					
1	What is wind tunnel?	A wind tunnel is a tool used in aerodynamic research to study the effects of air moving past solid objects.	Remember	CO 1	CLO 1	AAE509.01
2	What is wind tunnel model?	The solid objects in order to investigate flow or the effect of wind on the full-size object.	Remember	CO 1	CLO1	AAE509.01
3	What is the working principle of wind tunnel?	The working principle is based on the continuity and Bernoulli's equation	Remember	CO 1	CLO2	AAE509.02
4	What do you understand by scaling law?	Scaling laws are a concept in science and engineering. It refers to variables which change drastically depending on the scale (size) being considered.	Remember	CO 1	CLO3	AAE509.03
5	What is geometric similarity?	The model must be the same shape as the prototype, but may be scaled by some constant factor.	Remember	CO 1	CLO3	AAE509.03
6	What is kinematic similarity?	The velocity at any point in the model flow must be proportional by a constant scale factor to the velocity at the homologous point in the prototype flow.	Remember	CO 1	CLO3	AAE509.03
7	What is dynamic similarity?	All forces in the model flow must scale by a constant factor to the corresponding forces in the prototype flow. In other words, the relative importance of different types of forces must be the same for the model and prototype. This requires that the model and prototype have the same dimensionless	Remember	CO 1	CLO3	AAE509.03

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		parameters.				
8	What is Low speed tunnel?	Low-speed wind tunnels are used for operations at very low Mach number, with speeds in the test section up to 480 km/h.	Remember	CO 1	CLO4	AAE509.04
9	What is high-speed wind tunnel?	Subsonic, transonic and supersonic testing is accommodated in high speed wind tunnels. Intermittent or continuous operation is available, depending on the test mission and the speed range.	Remember	CO 1	CLO3	AAE509.03
10	What is the transonic wind tunnel?	High subsonic wind tunnels (0.4 < M < 0.75) and transonic wind tunnels (0.75 < M < 1.2) are designed on the same principles as the subsonic wind tunnels. The highest speed is reached in the test section.	Remember	CO 1	CLO3	AAE509.03
11	What is supersonic wind tunnel?	A supersonic wind tunnel is a wind tunnel that produces supersonic speeds (1.2<M<5) The Mach number and flow are determined by the nozzle geometry.	Remember	CO 1	CLO3	AAE509.03
12	What are the different types of low speed wind tunnel?	Closed-type wind tunnel Open-type wind tunnel Environmental wind tunnel Low turbulence level wind tunnel	Remember	CO 1	CLO3	AAE509.03
13	What are the different types of supersonic wind tunnel?	Blowdown type Suction type	Remember	CO 1	CLO3	AAE509.03
14	For high Mach number which types of wind tunnel is preferred.	Blowdown type	Remember	CO 1	CLO3	AAE509.03
15	Define is Reynolds number?	Ratio of Inertia force to Viscus force	Remember	CO 1	CLO4	AAE509.04
16	Define is Mach number?	Ratio of Inertia force to Pressure force	Remember	CO 1	CLO4	AAE509.04
17	List industrial domain where wind and fluid tunnels are used.	Aeronautics Marine Industry Civil Automobile	Remember	CO 1	CLO6	AAE509.06
	UNIT-II WIND TUNNEL EXPERIMENTATION CONSIDERATIONS					
1	What are the principal components of low speed wind tunnel?	Entry Convergent Test section Divergent Driving unit	Remember	CO 2	CLO2	AAE509.02
2	What are the principal components of close circuit low speed wind tunnel?	Entry Convergent Test section Divergent Driving unit Corner vans	Remember	CO 2	CLO2	AAE509.02
3	What are the principal components of supersonic wind tunnel?	Reservoir Compressor Gate valve Moisture remover Settling chamber Convergent section Throat	Remember	CO 2	CLO3	AAE509.03

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		Test section Second throat Divergent section				
4	What are the principal components of close circuit supersonic wind tunnel?	Reservoir Compressor Gate valve Moisture remover Settling chamber Convergent section Throat Test section Second throat Divergent section Corner vans	Remember	CO 2	CLO3	AAE509.03
5	What is limit of Mach number in suction type supersonic wind tunnel?	Mach number up to 2 only can be generated	Remember	CO 2	CLO8	AAE509.08
6	Which type of supersonic wind tunnel is easier to design?	Blowdown type supersonic wind tunnel	Remember	CO 2	CLO8	AAE509.08
7	What is energy ration?	The power obtained in the test section versus the powerinput; jet energy versus circuit losses	Remember	CO 2	CLO2	AAE509.02
8	What are the losses in wind tunnel?	Losses are due to: • Inefficiency of drive unit • Skin friction, separation etc • Loss of kinetic energy at the diffuser exit • Shocks in the case of supersonic wind - tunnels	Remember	CO 2	CLO8	AAE509.08
9	What is guide van?	The primary application in mind is the use of expanding corners in wind tunnels for the purpose of constructing compact circuits with low losses.	Remember	CO 2	CLO2	AAE509.02
10	What is the limits of contraction ratio?	4 to 20	Remember	CO 2	CLO8	AAE509.08
11	What is contraction ratio?	Area ratio of entry to exit of contraction section	Remember	CO 2	CLO2	AAE509.02
12	What is test section shock rhombus?	Using shock-expansion cancellation technique flow in the diverging part of a supersonic nozzle is brought back to free stream direction (direction parallel to the axis of nozzle) where a rhombus shaped region(Test Section) is formed in which uniform flow is ensured.	Remember	CO 2	CLO5	AAE509.05
13	What is test section blockage?	The blockage ratio is the ratio of frontal/projected/cross-section area (2D area seen from front view) upon the cross-section area of the test section. Blockage Ratio = Frontal Area of Model / Cross-section area of test section Generally a blockage of less than 5% should be preferred (Blockage effects are less). But for blockage more than 5%, blockage correction should be done to get good/valid results from experiments.	Remember	CO 2	CLO8	AAE509.08

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14	What is criteria for wind tunnel efficiency is determined?	The blockage due to the wake of the model.	Remember	CO 2	CLO8	AAE509.08
15	What is solid blockage?	An increase in free-stream velocity around the model caused by the constriction of the flow.	Remember	CO 2	CLO8	AAE509.08
	UNIT-III WIND TUNNEL BALANCE					
1	What the methods available for wind tunnel balance?	The wind tunnel balances, comprised by several hardware and software components, provides directly the pursued measurements, with high accuracy and reliability.	Remember	CO 3	CLO10	AAE509.10
2	Which loads are forces measured in wire- type balance?	Role, Pitch, Yaw are measured	Remember	CO 3	CLO10	AAE509.10
3	Why wind tunnel balance is used?	Full Scale 6 Component External Wind Tunnel Balance. The Wind Tunnel Balanceis a platform-type balance. ... Model Scale 6 Component External Wind Tunnel Balance. Refurbishment of Existing Wind Tunnel BalanceSystems.	Remember	CO 3	CLO10	AAE509.10
4	Which loads and forces measured in platform-type balance?	Vertical force can be measured i.e. lift and weight	Remember	CO 3	CLO10	AAE509.10
5	Which loads and forces measured in platform-type balance?	Lift and weight can be measured in platform – type measurement system	Remember	CO 3	CLO10	AAE509.10
6	Which loads are forces measured in Yoke-type balance?	Side force and drag can be measured.	Remember	CO 3	CLO10	AAE509.10
7	Which loads are forces measured in strain gauge-type balance?	All type of forces are measured by the stain gauge balance.	Remember	CO 3	CLO10	AAE509.10
8	How balance calibration is carried out?	By mapping with given standard values with repeated experiment.	Remember	CO 3	CLO10	AAE509.10
9	What is rake?	This is a device with total pressure probes arranged in a vertical mannar.	Remember	CO 3	CLO6	AAE509.06
10	What is tunnel surging?	In test section to control the velocity a small amount air is either injected or withdrawn.	Remember	CO 3	CLO6	AAE509.06
11	What is the limitation of turbulence sphere?	Beyond the drag coefficient value 0.3 the turbulence sphere doesn't provide accurate result.	Remember	CO 3	CLO7	AAE509.07
12	Define turbulence.	In fluid dynamics, turbulence or turbulent flow is any pattern of fluid motion characterized by chaotic changes in pressure and flow velocity.	Remember	CO 3	CLO7	AAE509.07
13	What is transient flow	The flow of a fluid is transient or unsteady if its flow parameters mix with adjacent layer.	Remember	CO 3	CLO7	AAE509.07
14	What is balance calibration?	Balance calibration is done by comparing with standard values provided by the OEM	Remember	CO 3	CLO8	AAE509.08
15	What is test section noise?	Noise due to interference of geometric shape. Error encountered due to measuring device is also referend as noise.	Remember	CO 3	CLO8	AAE509.08

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	UNIT-IV PRESSURE, VELOCITY & TEMPERATURE MEASUREMETNS					
1	What is static pressure?	The pressure exerted on the surface in normal direction of the body.	Remember	CO 4	CLO1	AAE509.01
2	What is dynamic pressure?	The pressure exerted due to velocity.	Remember	CO 4	CLO1	AAE509.01
3	What is gauge pressure	The pressure measured above the atmospheric pressure is called the gauge pressure.	Remember	CO 4	CLO1	AAE509.01
4	What is absolute pressure?	Atmospheric plus gauge pressure is known as absolute pressure.	Remember	CO 4	CLO1	AAE509.01
5	What is u tube manometer?	Pressure measuring devices using liquid columns in vertical tubes are called manometers	Remember	CO 4	CLO10	AAE509.10
6	What is inclined manometer?	Pressure measuring devices using liquid columns in inclined tubes are called manometers	Remember	CO 4	CLO10	AAE509.10
7	What is Pitot tube?	The device used for measuring total pressure or stagnation pressure.	Remember	CO 4	CLO10	AAE509.10
8	What is Pitot-static tube?	The device used for measuring dynamic pressure.	Remember	CO 4	CLO10	AAE509.10
9	What is potential flow?	The flow with irrotational and inviscid property is called potential flow.	Remember	CO 4	CLO1	AAE509.01
10	What is Bernoulli's principle?	Static pressure + dynamic pressure = constant.	Remember	CO 4	CLO15	AAE509.15
11	What is particle image velocimetry?	It is an electronic flow measurement device attached with very high speed camera to track the particle.	Remember	CO 4	CLO19	AAE509.19
12	What is boundary layer?	The boundary layer is the portion of fluid adjacent to the surface of an object around which the fluid is flowing. The layer is the boundary between the object and the free-flowing fluid.	Remember	CO 4	CLO6	AAE509.06
13	What is laminar flow?	In fluid dynamics, laminar flow (or streamline flow) occurs when a fluid flows in parallel layers, with no disruption between the layers.	Remember	CO 4	CLO1	AAE509.01
14	What is turbulent flow?	In fluid dynamics, laminar flow occurs when a fluid flows in parallel layers, with no disruption between the layers	Remember	CO 4	CLO1	AAE509.01
15	How air speed is measurements are made?	By using pitot-static tube the air speed can be measured.	Remember	CO 4	CLO11	AAE509.11
	UNIT-V FLOW VISUALIZATION TECHNIQUES					
1	What are flow visualization techniques used in wind tunnel?	Smoke, tuft, chemical coating, schlieren,	Remember	CO 5	CLO16	AAE509.16
2	What is streamline?	A streamline is a line which shows the direction of a flow.	Remember	CO 5	CLO1	AAE509.01
3	What is path line?	Pathline is the line traced by a given particle.	Remember	CO 5	CLO1	AAE509.01
4	What is streak line?	A streak line is the locus of the temporary locations of all particles that have passed though a fixed point in the flow field at any instant of time.	Remember	CO 5	CLO 1	AAE509.01
5	What is stream tube?	A region of the moving fluid bounded on the all sides by streamlines is called a tube of	Remember	CO 5	CLO1	AAE509.01

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		flow or stream tube.				
6	What is tufts?	A bunch or collection of threads, grass, hair, etc., held or growing together at the base.	Remember	CO 5	CLO1	AAE509.01
7	Why smoke study is conducted?	For flow visualization and wake study this experiment is conducted. .	Remember	CO 5	CLO12	AAE509.12
8	How change in density is measured in fluid flow?	By using schlieren techniques the change in density can be measured.	Remember	CO 5	CLO12	AAE509.12
9	What are the optical methods employed in wind tunnel?	PIV, Shadowgraph, Schlieren methods are used.	Remember	CO 5	CLO12	AAE509.12
10	Define density?	Density is the degree of compactness of a substance.	Remember	CO 5	CLO 1	AAE509.01
11	Define refractive index?	It defined as the ratio of the velocity of light in a vacuum to its velocity in a specified medium.	Remember	CO 5	CLO13	AAE509.13
12	What are the components of schlieren system?	Light source, trimmer, concave mirrors, knife edge, screen or camera.	Remember	CO 5	CLO 12	AAE509.12
13	What are the components of shadowgraph system?	Light source, trimmer, concave mirror, screen or camera.	Remember	CO 5	CLO 12	AAE509.12
14	What are the components of interferometry?	Light source concave mirror, light slitter, half policed, screen or camera.	Remember	CO 5	CLO 19	AAE509.19
15	What is PIV?	It is an electronic device attached with high speed camera to capture the particle velocity.	Remember	CO 5	CLO 18	AAE509.18

Signature of the Faculty

Signature of HOD, AE