



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## AERONAUTICAL ENGINEERING ASSIGNMENT QUESTIONS

<b>Course Name</b>	<b>:</b>	<b>AIRFRAME STRUCTURAL DESIGN</b>
<b>Course Code</b>	<b>:</b>	<b>R15-A72118</b>
<b>Class</b>	<b>:</b>	<b>IV B. Tech I Semester</b>
<b>Branch</b>	<b>:</b>	<b>Aeronautical Engineering</b>
<b>Year</b>	<b>:</b>	<b>2018 – 2019</b>
<b>Course Coordinator</b>	<b>:</b>	<b>Ms. M.MaryThraza, Assistant Professor, Dept of AE.</b>
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### OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

S. NO	Question	Blooms Taxonomy Level	Course Outcome
<b>ASSIGNMENT-I</b>			
<b>UNIT-I</b>			
<b>INTRODUCTION AIRWORTHINESS REQUIREMENTS</b>			
1	How is an airplane built? Explain with the help of a block diagram.	Understand	1
2	Discuss the design requirements of airframe structural design.	Remember	1
3	Explain Structural stiffness, aerodynamic characteristics in structural design criteria.	Understand	2
4	Discuss the sizing scenario in airframe structural design.	Understand	2
5	Explain any two principle structural components in brief.	Remember	3
6	Discuss the sizing scenario in airframe structural design.	Understand	3
7	How is an airplane built? Explain with the help of a block diagram.	Remember	4
8	Explain structural stiffness, aerodynamic characteristics in structural design criteria.	Remember	4
9	Explain the design requirements involved in the construction of an aircraft.	Understand	5
10	Explain briefly about structural components of aircraft.	Understand	5
<b>UNIT-II</b>			
<b>EXTERNAL LOADS-ESTIMATION, FASTENERS AND STRUCTURAL JOINTS</b>			
1	Explain various flight loads in brief.	Remember	5
2	Describe maneuver construction of flight envelope.	Remember	6
3	List out and explain the properties of engineering materials for use in the manufacture of an aircraft in detail.	Understand	6
4	What do you understand by the term Theories of failure"? Name and explain the important theories of failure.	Understand	7

S. NO	Question	Blooms Taxonomy Level	Course Outcome
5	Define and explain the following theories of failures. a. Maximum shear stress. b. Maximum strain energy theorem c. Maximum shear strain energy	Remember	8
6	Explain critical load conditions in different mission profile of an aircraft or loads greater than the critical load	Understand	8
7	Discuss Air worthiness requirements and how certification of airworthiness is conferred?	Understand	8
8	What do you understand by the term Theories of failure"? Name and explain the important theories of failure.	Remember	9
9	A thin cylindrical shell, 2.5 m in diameter is composed of plates 12.5 mm thick. The yield stress of for the material is 300 N/mm <sup>2</sup> . Calculate the internal pressure which would cause yielding according to the following theories of failure. a. Maximum shear stress, b. Maximum strain energy, c. Maximum shear strain energy. Poisson's ratio=0.25.	Understand	9
10	A shaft is subjected to a maximum allowable torque of 10kNm & maximum allowable bending moment of 7.5 kNm at a particular section. If the allowable equivalent stress in simple tension is 160 MN/m <sup>2</sup> <b>calculate</b> the diameter of the shaft according to: a. Maximum shear stress theory, b. Strain energy theory and c. Shear strain energy theory. Poisson's ratio is 0.24	Remember	9
<b>UNIT-III</b>			
<b>EXTERNAL LOADS-ESTIMATION, FASTENERS AND STRUCTURAL JOINTS</b>			
1	Discuss wing layout. How to design an unpowered aircraft that glide in air for maximum distance and time	Remember	10
2	Explain briefly ribs and bulkheads-rib spacing and arrangement.	Remember	10
3	Discuss the problems with swept wings in fighter wing design.	Understand	10
4	What are the advantages of single, double and triple slotted flaps?	Understand	11
5	Draw and explain different types of wing leading and trailing edges used to increase the maximum lift at low speed flight.	Understand	11
<b>ASSIGNMENT-II</b>			
<b>UNIT-III</b>			
<b>EXTERNAL LOADS-ESTIMATION, FASTENERS AND STRUCTURAL JOINTS</b>			
6	Discuss mechanical design of wing and tail unit structures and its design considerations	Remember	12
7	Explain the phenomenon of distribution of concentrated loads on thin webs in aircraft structure.	Understand	12
8	Explain about structural optimization of wing box.	Understand	13
9	Discuss structural layout and design consideration of tail unit.	Remember	13
10	Demonstrate the phenomenon of calculating the bending moments in ribs of a wing.	Understand	13
<b>UNIT-IV</b>			
<b>DESIGN OF FUSELAGE, LANDING GEAR, ENGINE MOUNTS</b>			
1	Discuss fuselage openings and its design considerations	Remember	14
2	Describe the principal structural components of a fuselage.	Remember	14
3	Explain the wing and fuselage intersection with the help of a neat sketch	Understand	14
4	Discuss the assembly of leading and trailing edges.	Understand	14
5	Discuss about tail unit. Explain rudder and its configuration.	Remember	15
6	Explain the altitudes of the airplane that are specified by government aviation agencies for design of landing gear with neat sketches.	Understand	15
7	Give a brief summary of fuselage loads and explain fuselage configuration	Understand	13
8	Explain the construction of a Tricycle landing gear, with neat sketches.	Remember	13

S. NO	Question	Blooms Taxonomy Level	Course Outcome
9	Explain current Landing Gear Design of, a. Boeing B747 b. Lockheed C-5 c. C-141 d. Fighter Airplane.	Remember	13
10	Explain engine mounts? how it works, symptoms, problems by taking an example?	Understand	13
<b>UNIT-V</b>			
<b>FATIGUE LIFE, DAMAGE TOLERANCE, FAIL-SAFE DESIGN- WEIGHT CONTROL AND BALANCE</b>			
1	Discuss the process of estimation of fatigue strength.	Remember	14
2	Describe the concept of fatigue crack propagation	Remember	14
3	What are the design strategies for improving system reliability? Explain in general and in the context of structures.	Understand	14
4	Demonstrate the scatter factor and its significance	Remember	14
5	Explain the service behavior of aircraft structures and the effect of physical and load environment design	Remember	15
6	Memorize modes of failure. Discuss catastrophic effects of fatigue failure.	Understand	15
7	Write short notes on. a. Fatigue stress. b. Fatigue performance. c. Fatigue life.	Understand	14
8	What is mean by S-N Curve and explain its significance in Fatigue failure.	Remember	14
9	Describe the concept of fatigue crack propagation.	Understand	14
10	Demonstrate the theories of failure in structural design	Understand	14

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