

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Winter 2019 - 20 Examination

Semester: 3**Subject Code: 03101201****Subject Name: Elements of Aeronautics****Date: 25/11/2019****Time: 2.00 pm to 4.30 pm****Total Marks: 60****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (All are compulsory) (Each of one mark) (15)

1. What word describes a force that slows an object when air pushes against it?
(a) Drag, (b) Down force, (c) Drafting, (d) Deceleration
2. What is aerodynamics?
3. The temperature at 16 km height above earth surface is aprox. _____
4. _____ types of gas turbine engine have highest propulsive efficiency?
5. What are the four typical loads on an aircraft?
 - a) Tension, torsion, creep, elongation,
 - b) Elasticity, shear, compression, torsion
 - c) Tension, compression, torsion, shear
 - d) Compression, buckling, elasticity, shear
6. What is the function of ribs in aircraft?
7. Define Chord line in airfoil.
8. For a vertical tail which of the following airfoil is suitable?
 - a) NACA 0012
 - b) NACA2312
 - c) NACA23012
 - d) Y profile
9. For the supersonic flow in a convergent duct
 - a) Velocity decreases
 - b) Velocity increases
 - c) Velocity increases then decreases
 - d) Remains same throughout the duct
10. What are types of propulsion system?
11. Define Avionics.
12. What is a winglet?
13. What is a Balance force?
14. The air temperature at the stagnation point at the leading edge of the wing for the aircraft flying at Mach 0.5 at sea level is _____.
15. How is the Variable Frequency of VOR modulated?
 - (a) Frequency Modulated,
 - (b) Phase Modulated,
 - (c) Amplitude Modulated,
 - (d) No one

Q.2 Answer the following questions. (Attempt any three) (15)

A) With help of neat sketch explain airfoil nomenclature.

B) Consider a low speed subsonic wind tunnel designed with inlet cross section area $A_1 = 4 \text{ m}^2$ and a test section cross section area $A_2 = 1 \text{ m}^2$. The pressure in the test section is $P_2 = 1.1 \text{ KPa}$. (Assume Sea level density).

I. Calculate the pressure required in the pressure required at the inlet and velocity, necessary to achieve a flow velocity of 60 m/s in the test section.

II. Calculate the mass flow through the wind tunnel.

C) Explain “Turbo Fan Engine” with neat sketch.

D) Explain Reference Frames using Neat Sketch.

Q.3 A) Explain working principle of subsonic Wind tunnel with help of suitable diagram. (07)

B) Derive the pressure and density variations of a standard atmosphere (08)

OR

B) What are the different types of altitudes in ISA? Derive Relation between Geometric and Geopotential Altitude. (08)

Q.4 A) With help of sketch explain about monocoque and semi-monocoque constructions. (07)

OR

A) Explain main components of truss type fuselage structure with neat sketch. (07)

B) Consider a Turbojet powered airplane flying at a standard altitude of 12192 m at a velocity of 853kmph. The turbojet engine has inlet and exit areas of 0.93 m^2 and 1.21 m^2 , respectively. The velocity and pressure of the exhaust gas at the exit are 457.2 m/s and 21397.5 Pa , respectively. Calculate the Thrust of the Engine. (08)