Question Paper

Exam Date & Time: 08-Jul-2022 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
II SEMESTER B.Sc.(Applied Sciences) in Engg.
END SEMESTER THEORY EXAMINATION- MAY/JUNE-2022

Introduction To Aerospace Engg. and Avionics [IAV 121 - S2]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Any missing data may be suitably assumed.
Standard atmosphere data table can be used.

1)	A)	With diagram, explain the basic components, primary and secondary control surfaces of an airplane and there functionalities.	(5)
	B)	With necessary block diagram, explain about various subsystems of spacecraft. List the differences between an aircraft and a spacecraft.	(5)
2)	A)	What is standard atmosphere and why it is required? At 12 km in the standard atmosphere, the pressure, density, and temperature are 1.9399 x 10^4 N/m^2, 3.1194 x 10^{-1} kg/m^3, and 216.66 K, respectively. Using these values, calculate the standard atmospheric values of pressure, density, and temperature at an altitude of 14 km.	(5)
	B)	Derive an expression for relating the pressure and velocity at points 1 and 2 on an airfoil surface which is kept in an incompressible flow field.	(5)
3)	A)	In the combustion chamber of a rocket engine, kerosene and oxygen are burned, resulting in a hot, high pressure gas mixture in the combustion chamber with the following conditions and properties: Chamber temperature = 3144K, chamber pressure = 20 atm, R = 378 J/(kg)K and γ = 1.26. The pressure at the exit of the rocket nozzle is 1 atm, and the throat area of the nozzle is 0.1 m^2. Assume Isentropic flow through the rocket nozzle. Calculate (a) the velocity at the exit (b) mass flow through the nozzle.	(5)
	B)	With force diagram, derive the equations of motion for a level, unaccelerated and steady flight. Also explain the variation of thrust required w.r.t variation in angle of attack and velocity	(5)
4)		Write about the various primary components used in head up display	(4)