Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Course: Aircraft System & Instruments **Semester: III**
Program: B.Tech ASE **Time : 03 hrs.**
Course Code: ASEG2019 **Max. Marks: 100**

Instructions: All questions are compulsory
Use figures to explain the concept.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Explain how a pilot can rely on alternative systems to maintain control of the aircraft in the event of a hydraulic failure.	**4**	**CO2**
Q 2	Describe the process by which the lubricating system in a piston engine reduces wear and friction. Why is this process vital for efficient engine operation?	**4**	**CO3**
Q 3	Analyze the function of accelerometers in flight instruments and explain how they improve the accuracy of navigation, particularly in attitude indicators.	**4**	**CO1**
Q 4	Discuss how aircraft fire protection systems detect fires and the techniques used to suppress them in various critical areas of the aircraft.	**4**	**CO3**
Q 5	Explain the working principle of Evaporative air cycle systems and evaluate their role in maintaining optimal cabin conditions for passenger comfort.	**4**	**CO3**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Analyze how deicing and anti-icing systems operate to maintain flight safety in icy conditions. Evaluate the impact of recent advancements in technology, such as thermal anti-icing systems used in modern aircraft, on the design and efficiency of these systems. Include an example of an incident where ice accumulation affected flight performance.	**10**	**CO3**
Q 7	Explain the principles behind airspeed measurement in aircraft, particularly focusing on the differences between True Airspeed (TAS) and Indicated Airspeed (IAS). Apply this understanding to assess the impact of errors in airspeed measurement. **OR** If tasked with designing a new starting system for a piston engine, propose features that would improve its reliability and safety in	**10**	**CO1**

	diverse environmental conditions. Evaluate how your design would prevent issues that have led to past starting failures.		
Q 8	Examine how autopilot systems integrate active control technology to enhance flight safety and operational efficiency. Evaluate the implications of relying on autopilot, particularly in recent incidents where system over-reliance affected pilot response.	**10**	**CO1**
Q 9	Describe the evolution of aircraft control systems from conventional mechanical controls to modern digital fly-by-wire (FBW) systems. Analyze how each stage of development contributed to increased safety and control precision.	**10**	**CO1**
SECTION-C (2Qx20M=40 Marks)			
Q 10	a) Explain how the system measures airspeed, altitude, and vertical speed based on pressure differences.	**10**	**CO3**
	b) Discuss briefly about gyroscopic systems with necessary diagrams.	**10**	**CO3**
Q 11	Discuss the 2018 Lion Air Flight 610 and 2019 Ethiopian Airlines Flight 302 crashes, both of which were attributed to MCAS-related issues. Analyze how the system's reliance on a single Angle of Attack (AoA) sensor, lack of redundancy, and insufficient pilot training on MCAS operations contributed to these tragic incidents. **OR** Analyze the potential consequences of inaccurate readings from key flight instruments during a flight, and how they can impact safety and decision-making. How can the data obtained from temperature gauges and pressure gauges be used to identify potential system malfunctions? (You can use any airplane model for explanation.)	**20**	**CO1**