U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B E **Semester: IV**
Branch: Aerospace Engineering **Duration: 3 hrs.**
Course Code: 19AE4DCAAI **Max Marks: 100**
Course: Aircraft Systems, Avionics and Instrumentation **Date: 19.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1	a)	What is the purpose of an accumulator in aircraft hydraulic system? Using a diagram, explain the functioning of an accumulator used in aircraft. Which are the subsystems of aircraft hydraulic system that use accumulator and why?	**6**
	b)	Draw the sketch of a Multi-Disc Brake and explain briefly its functioning.	**3**
	c)	With the help of a sketch explain the functioning of a FCOC.	**6**
	d)	Using a block diagram, explain the functioning of various components of a Pneumatic system needed to operate an actuator.	**5**

UNIT - II

2	a)	Enumerate the differences among Fully powered, Power Assisted and Fly-By-Wire Flight Control Systems.	**6**
	b)	What is the purpose of Artificial Feel Unit in Power Assisted and Fly-By-Wire Flight Control Systems? Using a diagram, explain the concept of functioning of Artificial Feel Unit.	**4**
	c)	What is the role of a Trim Tab?	**2**
	d)	Using a block diagram, explain the concept and components of Digital Fly-By-Wire Flight Control System	**8**

UNIT - III

3	a)	Using a diagram, explain the components of a Gravity-fed aircraft fuel system.	**8**
	b)	What do you understand by the following w.r.t. an Engine Lubrication System:	**6**
		(i) A Dry Sump System.	
		(ii) A Wet Sump System.	
	c)	Give a description of the process of starting a Gas Turbine Engine.	**6**

OR

4 a) Write a note about Bird Strikes with an emphasis on the likely zones to be affected on an aircraft, reasons for this menace, how the airframe is designed to reduce damage and lastly the measures to be taken to mitigate this occurrence. **8**

b) With a sketch, explain the process of starting a Piston Engine aircraft using a Magneto Ignition System. **6**

c) With the help of a sketch explain the functioning of a Gear Pump. **6**

UNIT IV

5 a) What do you understand by basic Air Cycle System? Using a diagram, explain the components and functioning of air conditioning system in a turbine engine equipped aircraft. **5**

b) What is the need of Air Conditioning and pressurization in an aircraft? **3**

c) What is the purpose Anti-icing and De-icing systems in an aircraft? Where in the aircraft Anti-icing system and De-icing systems are used and why? **4**

d) A bootstrap cooling system of 35 tones is required for an aircraft. Temperature and pressure of atmosphere is 18 deg C and 0.75 bar respectively. During flying, pressure of air is increased from 0.75 bar to 0.92 bar due to ram air. Pressure of air leaving the main compressor and auxiliary are 3.2 and 5.4 bar respectively. Isentropic efficiency of both compressors is 84% and that of turbine is 81%. Heat removed from air leaving the compressor is 60%in the first heat exchanger and 34% in the second heat exchanger which is after auxiliary compressor. Temperature of the air leaving the cabin is 28 deg C. Assuming ram air to be Isentropic and cabin pressure 1.03 bar, find: **8**

(i) Power required to take the cabin load.
(ii) Coefficient of Performance.

UNIT - V

6 a) What do you understand by Navigation and Guidance? What are the types of Navigation systems that are employed in an aircraft? **5**

b) What is the need of Collision Avoidance System in the present day aircraft? Using suitable figures and block diagram, explain the functioning of Collison Avoidance System. **5**

c) What do you understand by ‘Rigidity’ and ‘Precession’ in a gyroscope? What is the need for Artificial Horizon instrument in aircraft? Using suitable diagram, explain the functioning of Artificial Horizon. **5**

d) Describe clearly one technique used to measure the Engine Oil Temperature. **5**

OR

7 a) What instrumentation techniques are used to make the following measurements for aeroengine: **3**

(i) Exhaust Gas Temperature
(ii) Fuel Flow.
(iii) Compressor & Turbine Vibrations

b) Using suitable diagrams, discuss the following: **6**

(i) Principle of operation of a Vertical Speed Indicator
(ii) Principle of operation of an Altimeter

c) Explain the working principle of Total Air temperature Probe and Pitot Static Probes. **6**

d) Explain the corrections applied to Indicated Air Speed to obtain the TAS. **5**

******