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

Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E. **Semester: IV**

Branch: Aerospace Engineering **Duration: 3 hrs.**

Course Code: 23AS4PCASI **Max Marks: 100**

Course: Aircraft Systems and Instrumentation

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

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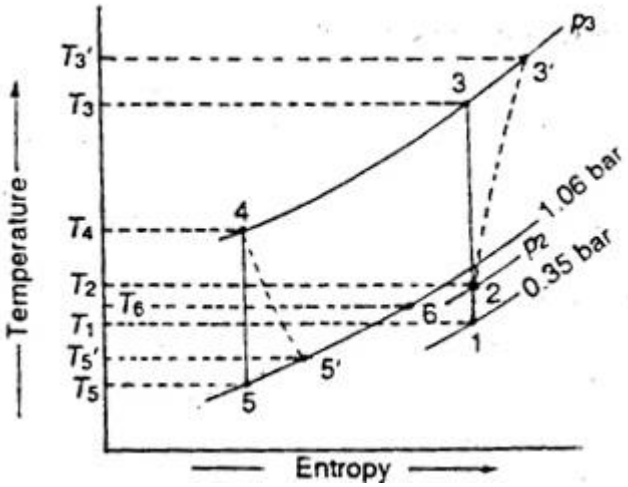
Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	What are the primary requirements of a landing gear mechanisms in an aircraft? Explain in detail about its types.	*CO1*	*PO1*	**08**
	b)	Illustrate the working principle of pneumatic systems with the help of suitable sketches.	*CO1*	*PO1*	**08**
	c)	Explain the classification of landing gear based on the mechanisms used.	*CO1*	*PO1*	**04**
		UNIT - II			
2	a)	With the help of block diagram, explain the fourth-generation flight control systems which replaced the manual flight control (pulleys, push pull rods) with electrical wires and computers.	*CO1*	*PO1*	**08**
	b)	Explain briefly, about MCAS, with reference to the aircraft on which it was implemented.	*CO1*	*PO1*	**06**
	c)	Write a note on an autopilot highlighting the definition of Control Modes.	*CO1*	*PO1*	**06**
		UNIT - III			
3	a)	What do you understand by the following w.r.t. an Engine Lubrication System: (i) A Dry Sump System. (ii) A Wet Sump System	*CO1*	*PO1*	**08**
	b)	Describe the working principle of transistorised ignition System with suitable sketches.	*CO1*	*PO1*	**06**
	c)	Give a description of the process of starting a gas turbine engine.	*CO1*	*PO1*	**06**
		UNIT - IV			
4	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.	*CO1*	*PO1*	**08**
	b)	The cock pit of a jet plane flying at a speed of 1200 km/h is to be cooled by a simple air cooling system. The cock pit is to be	*CO3*	*PO1, 3*	**12**

			maintained at 25°C and the pressure in the cock pit is 1 bar. The ambient air pressure and temperature are 0.85 bar and 30°C. The other data available is as follows: cock-pit cooling load = 10 TR , main compressor pressure ratio = 4 , ram efficiency = 90% , temperature of air leaving the heat exchanger and entering the cooling turbine = 60° C , pressure drop in the heat exchanger = 0.5 bar , pressure loss between the cooler turbine and cockpit = 0.2 bar. Assuming the isentropic efficiencies of main compressor and cooler turbine as 80%, find the quantity of air passed through the cooling turbine and C.O.P. of the system. Take γ=1.4 and c_p/c_v= 1 kJ/kg K. Also draw its T-s diagram.			
			OR			
	5	a)	What is the Partial Pressure of Oxygen at ISA conditions? What is the need for a Life Support System in an aircraft and give a brief description of OBOGS.	*CO1*	*PO1*	**08**
		b)	An aircraft moving with speed of 1000 km/h uses simple gas refrigeration cycle for air-conditioning. The ambient pressure and temperature are 0.35 bar and -10° C respectively. The pressure ratio of compressor is 4.5. The heat exchanger effectiveness is 0.95. The isentropic efficiencies of compressor and expander are 0.8 each. The cabin pressure and temperature is 1.06 bar and 25° C. Determine temperatures and pressures at all points of the cycle. Also find the volume flow rate through compressor inlet and expander outlet for 100 TR. Take c_p/c_v = 1.005 kJ/kg K; R = 0.287 kJ/kg K and c_p/c_v =1.4 = for air.  Fig 5b	*CO3*	*PO3*	**08**
		c)	What is the need for air conditioning and pressurization in an aircraft?	*CO1*	*PO1*	**04**
			UNIT - V			
	6	a)	Using suitable diagrams, discuss the following: (i) Principle of operation of a Vertical Speed Indicator (ii) Principle of operation of an Altimeter	*CO1*	*PO1*	**08**
		b)	Explain the working principles of gyroscopic instruments	*CO1*	*PO1*	**08**

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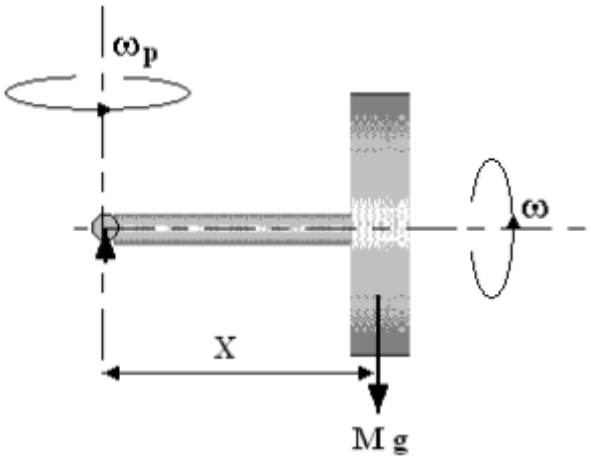
		c)	A top consists of a spinning disc of radius 50 mm and mass 0.8 kg mounted at the end of a light rod as shown. If the disc rests on a pivot with its axis of spin horizontal as shown, and the distance X is 30 mm, calculate the velocity of the precession when its spins at 40 rev/min.  Fig. 6c	*CO3*	*PO3*	**04**
			OR			
	7	a)	Describe the working principle of pitot-static system. Also mention the instruments which works based on this system.	*CO1*	*PO1*	**12**
		b)	Enumerate various types of engine instruments and explain any five of them in detail.	*CO2*	*PO1*	**08**

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