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BAE403

Fourth Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024
Aircraft Propulsion

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the working principle of Aircraft propulsion and classify the different types of Aircraft power plant.	8	L2	CO1
	b.	List out the major difference between air – breathing and non – air breathing engine.	6	L1	CO1
	c.	Discuss the following : i) Mach Number ii) Stagnation pressure.	6	L1	CO1
		OR			
Q.2	a.	Explain with neat diagram of working principle of a petrol engine. Draw the P – V and T- S diagram.	10	L2	CO2
	b.	Draw a schematic diagram of a gas turbine engine. Explain its components and their functions.	10	L2	CO2
		Module – 2			
Q.3	a.	Derive the expression for Momentum theory for a propeller with suitable assumptions.	10	L3	CO3
	b.	Draw a neat diagram and explain Blade element theory and criteria for blade selection.	10	L3	CO3
		OR			
Q.4	a.	With the help of a schematic diagram, explain the working principle of turbofan engine. List its advantages and disadvantages.	10	L2	CO2
	b.	The effective jet exit velocity from a jet engine is 2700 m/s. the forward flight velocity is 1350 m/s and the air flow rate is 78.6 kg/s. Calculate i) Thrust ii) Propulsive efficiency.	6	L3	CO2
	c.	Discuss the different methods of Thrust augmentation.	4	L1	CO2
		Module – 3			
Q.5	a.	Write the purpose of inlet in gas turbine engine. Explain the operation of subsonic inlets under various operating condition with diagram.	10	L2	CO3
	b.	An aircraft flies at 800 nm/hr at an altitude of 10,000 m (T = 223.15K , P = 0.264 bar). The air is reversibly compressed in an inlet diffuser. If the mach number at the exist of the diffuser is 0.36 determine i) Entry Mach number ii) Temperature of air at the diffuser exit	10	L3	CO3

		OR			
Q.6	a.	Explain with neat sketches, shock swallowing in supersonic inlets.	6	L2	CO3
	b.	Illustrate the working of convergent nozzle and plot the variation of mass flow rate and pressure ratio.	8	L2	CO3
	c.	Write short note on : i) Variable area Nozzle ii) Thrust Reversal.	6	L2	CO3
		Module – 4			
Q.7	a.	Describe the essential parts of a centrifugal compressor and explain its principle of operation with neat sketch.	10	L2	CO4
	b.	A centrifugal compressor under test gave the following data : Speed 11,500 rpm , Inlet total head temperature 21°C , Outlet and inlet total head pressure is 4 bar and 1 bar , Impeller diameter is 75cm. If the slip factor is 0.92, what is the compressor efficiency?	10	L3	CO4
		OR			
Q.8	a.	Define Degree of reaction. Derive an expression for degree of reaction with usual notations for an axial flow compressor.	10	L2	CO4
	b.	Explain Surging and Stall of axial flow compressor.	10	L2	CO4
		Module – 5			
Q.9	a.	Describe the process of combustion in a gas turbine engine. With neat sketch explain different zones of combustion.	10	L2	CO5
	b.	Write short notes on : i) Flame tube cooling ii) Fuel Injection system.	10	L2	CO5
		OR			
Q.10	a.	Draw the variation of pressure and velocity in a reaction turbine and explain the operating principle.	10	L2	CO5
	b.	Elaborate different methods used for turbine blade cooling with relevant sketches.	10	L2	CO5

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