CBCS SCHEME

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BAE403

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
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.	With the help of a neat schematic PV and TS diagram, explain working of four stroke diesel engine with sketch.	10	L2	CO2
	b.	Explain the principle of aircraft propulsion and the types of fluid suitable for aircraft propulsion.	10	L2	CO2
		OR			
Q.2	a.	Describe Brayton cycle with PV and TS diagram with advantages of gas turbine over reciprocating engine.	10	L2	CO3
	b.	Explain the working of four stroke petrol engine with sketch.	10	L2	CO3
		Module – 2			
Q.3	a.	Explain the methods of thrust augmentation.	10	L3	CO4
	b.	Define thrust and prove $F = m_i[(1 + t) C_j - C_i]$	10	L4	CO4
		OR			
Q.4	a.	Derive the expression for momentum theory with assumptions.	12	L3	CO4
	b.	Discuss the performance characteristics of turbojet engine.	08	L4	CO5
		Module – 3			
Q.5	a.	Briefly discuss about the starting problem associated with supersonic inlets and explain phenomenon of shock swallowing.	10	L2	CO4
	b.	Discuss the purpose of inlets in gas turbine engine. Explain about subsonic inlets.	10	L2	CO3
		OR			
Q.6	a.	Define thrust reversal and explain the methods of thrust reversal.	10	L3	CO2
	b.	Derive the relationship for min. area ratio (A_{max}/A_i) in terms of external deceleration and coefficient of pressure.	10	L4	CO4
		Module – 4			
Q.7	a.	Explain the principle operation of centrifugal compressor with hs diagram.	10	L2	CO2
	b.	A centrifugal compressor running at speed of 11,500 rev/min with inlet total heat temperature of 21°C has inlet and outlet total head of pressure as 1 bar and 4 bar. The diameter of impeller is 75 cm and slip factor is 0.92. Determine the compressor efficiency.	10	L4	CO3
		OR			
Q.8	a.	Define degree of reaction of an axial flow compressor and derive the expression for the same.	10	L2	CO3
	b.	Describe surging and stall of axial flow compressor vaneless and vaned diffuser.	10	L2	CO3
		Module – 5			
Q.9	a.	With suitable sketch, explain impulse and reaction turbine.	10	L2	CO3
	b.	Describe external and internal cooling of turbine blades with relevant sketch.	10	L3	CO4

		OR			
Q.10	**a.**	Explain the types of combustion chamber used in gas turbine engines with sketch with merits and demerits.	**10**	**L2**	**CO3**
	b.	In impulse turbine the gas at 7 bar and 300°C expands to 3 bar. The nozzle angle is 70°C with reference to the exit direction. The rotor blades have equal inlet and outlet angle and the stage operates with optimum blade speed ratio. Assume that the isentropic efficiency of nozzle is 0.9 and the velocity at entry to stage is negligible, deduce the blade angle used and the mass flow required for this stage to produce 75 kN. Take C_p = 1.15 kJ/kgK.	**10**	**L4**	**CO5**

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