

CBCS SCHEME

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BAE403

Fourth Semester B.E./B.Tech Degree 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.	Elaborate the working principle of A-stroke petrol engine using P – V and T – S diagram. Also mention advantages, disadvantages and applications of petrol engine.	12	L1	CO1
	b.	Briefly classify the different power plants of an aircraft engine.	8	L1	CO1
OR					
Q.2	a.	Explain Brayton cycle with P – V and T – S diagram and also write neat diagram of open cycle gas turbine.	10	L2	CO1
	b.	Write the comparison between gas turbine engines over reciprocated engine.	6	L1	CO1
	c.	Mention the advantages, disadvantages and applications of two stroke engine.	4	L1	CO1
Module – 2					
Q.3	a.	Explain types of propellers with a neat sketch.	9	L1	CO1
	b.	Derive the expression for momentum thrust of a propeller.	8	L2	CO1
	c.	Write the characteristics of turbo fan engine.	3	L2	CO1
OR					
Q.4	a.	An aircraft flies of 960kmph one of its turbojet engines takes in 40kg/s of air and expands the gases to the ambient pressure. The air fuel ratio is 50 and the lower calorific value of the fuel is 43kJ/kg. For maximum thrust power determine : i) Jet velocity ii) Thrust iii) Specific thrust iv) Thrust power v) Propulsive thermal and overall efficiencies vi) TSFC.	10	L4	CO1
	b.	Derive thrust equation for a propulsive device and varies factors affecting thrust.	10	L3	CO1

Module – 3

Q.5	a.	List the purpose of inlets in gas turbine engine and ex subsonic inlet with neat sketch.	8	L2	CO3
	b.	Derive a relation for minimum area ratio (A_{\max}/A_i) in terms of external deceleration and co-efficient of pressure.	8	L3	CO3
	c.	Briefly explain supersonic inlet with sketch.	4	L2	CO3

OR

Q.6	a.	Explain the concept of shock swallowing by area variation in supersonic inlets.	8	L2	CO3
	b.	List and explain the various losses in nozzles.	6	L2	CO3
	c.	What is thrust vectoring and explain the various thrust vectoring methods.	6	L3	CO3

Module – 4

Q.7	a.	With a neat sketch explain the principle of operation of centrifugal compressor with h – s diagram.	10	L2	CO2
	b.	Define degree of reaction of an axial flow compressor and derive an expression for the same.	10	L3	CO2

OR

Q.8	a.	Discuss the following for a centrifugal compressor. i) Concept of pre-whirl and rotational stall ii) Performance characteristics of centrifugal compressor.	10	L2	CO2
	b.	A centrifugal compressor under test gave the following data : Speed = 11,500rev/min; inlet total head temperature = 21°C, output and inlet total head pressure is 4 bar and 1 bar respectively, Impeller diameter = 75cm, if the slip factor is 0.92, what is the compressor efficiency?	10	L4	CO2

Module – 5

Q.9	a.	Explain the different types of combustion chambers with relevant sketches, list their advantages and disadvantages.	12	L2	CO2
	b.	Write short notes on : i) Flame tube cooling ii) Flame stabilization.	8	L2	CO2

OR

Q.10	a.	Elaborate OA the different methods used for turbine blade cooling with relevant sketch.	10	L2	CO1
	b.	Mention different losses in turbines and explain.	5	L2	CO1
	c.	With a neat sketch explain radial flow turbine.	5	L2	CO1