



# CBCS SCHEME - Make-Up Exam

BAE403

## Fourth Semester B.E/B.Tech. Degree Examination, June/July 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.

<b>Module - 1</b>			
		M	L
1	a.	Describe the working principle of Four stroke : i) CI and ii) SI engine using PV and TS diagrams.	10
	b.	Explain the working principle of aircraft propulsion and classify different types of power plant.	10
<b>OR</b>			
2	a.	Write an expression for steady flow energy equation for compressible flow with usual notation.	8
	b.	Differentiate gas turbine engine and reciprocating engine.	6
	c.	Write the advantages and disadvantages and application of two stroke engine.	6
<b>Module - 2</b>			
3	a.	List different types of propellers and briefly explain propeller nomenclature with neat sketch.	10
	b.	Derive the expression for momentum theory for a propeller with suitable assumptions.	10
<b>OR</b>			
4	a.	Illustrate and explain the working of Turbofan engine. Write the advantages and disadvantages of this engine.	12
	b.	The effective jet velocity of a jet engine is 1800 m/s. the forward velocity is 1200 m/s. Airflow rate is 80 kg/s. Calculate i) Thrust ii) Thrust power iii) Propulsion efficiency.	8
<b>Module - 3</b>			
5	a.	What is the purpose of inlet in gas turbine engine? Explain the operation of subsonic inlets under various operating conditions.	10
	b.	Obtain the relation for minimum area ratio ( $A_{max}/A_i$ ) in terms of external deceleration and coefficient of pressure.	10

**OR**

6	a.	Explain the concept of shock swallowing by area variation in supersonic inlets.	10	L2	CO3
	b.	Enumerate the flow conditions in a Convergent Divergent (C – D) nozzle for varying back pressure conditions.	10	L3	CO3

**Module – 4**

7	a.	With a neat sketch, explain the principle of operation of a centrifugal compressor for a gas turbine engine. Derive expression for work.	10	L2	CO4
	b.	Discuss the performance characteristics of centrifugal compressor based on the dependence of pressure ratio and efficiency on the mass flow at different speeds.	10	L2	CO4

**OR**

8	a.	Describe the essential parts of axial flow compressor with a neat sketch. Explain the principle of operation with the help of velocity triangles.	10	L2	CO4
	b.	Define degree of reaction (R) for an axial flow compressor and derive an expression for the same.	10	L2	CO4

**Module – 5**

9	a.	Describe the process of combustion in a gas turbine engine. With a neat sketch, explain different zones of combustion.	10	L2	CO5
	b.	What are the different types of combustion chambers? Explain with neat sketches.	10	L2	CO5

**OR**

10	a.	Analyse and discuss the different methods used in turbine cooling.	10	L2	CO5
	b.	Explain the concept of estimating losses in turbines with relevant sketches.	10	L2	CO5

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