

# CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

21AE52

## Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Aircraft Propulsion

Time: 3 hrs.

Max. Marks: 100

**Note:** Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Briefly discuss the principle of Aircraft propulsion and classify the different types of aircraft power plants. (10 Marks)  
b. Write the comparison between gas turbine engines over reciprocating engine. (10 Marks)

OR

- 2 a. Explain the working principle of 4-stroke CI engine using PV and TS diagram. (10 Marks)  
b. What are the various components of an IC Engines? Explain with neat sketch their functional importance. (10 Marks)

### Module-2

- 3 a. Discuss different types of propellers and write the propeller nomenclature with neat sketch. (10 Marks)  
b. Derive the expression for momentum theory for a propeller with suitable assumptions. (10 Marks)

OR

- 4 a. Illustrate with neat sketch of Turbofan engine. What are the advantages and disadvantages of the engine? (10 Marks)  
b. Define thrust and derive thrust equation for a propulsive device. (10 Marks)

### Module-3

- 5 a. List the purpose of inlets in gas turbine engines. Briefly explain subsonic inlets. (10 Marks)  
b. Obtain a relation for minimum area ratio ( $A_{max}/A_i$ ) in terms of external deceleration and co-efficient of pressure. (10 Marks)

OR

- 6 a. With the help of relevant sketches, describe the process of shock swallowing by area variation. (10 Marks)  
b. Elaborate with neat sketch, under expanded and over expanded nozzles. (10 Marks)

### Module-4

- 7 a. Explain the process of surging and choking in centrifugal compressor. (10 Marks)  
b. Define degree of reaction. Derive an expression for same with usual notations. (10 Marks)

OR

- 8 a. Describe the essential parts of axial flow compressor with a neat sketch. Explain the principle of operation. (10 Marks)  
b. Discuss the following with relevant sketches :  
(i) Surging and Stall of axial flow compressor.  
(ii) Vaneless and Vaned diffuser. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

**Module-5**

- 9 a. With the help of a neat sketch, explain the combustion chamber geometry. Also explain the different zones of combustion. (10 Marks)
- b. Explain different types of combustion chambers used in gas turbine engine. List their advantages and disadvantages. (10 Marks)

OR

- 10 a. Illustrate the different methods used for turbine blade cooling with relevant sketches. (10 Marks)
- b. Explain the different methods of fixing of blades to the turbine discs in a gas turbine. (10 Marks)

\*\*\*\*\*