

# CBCS SCHEME

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## Fourth Semester B.E. Degree Examination, June/July 2023 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. Explain with a neat sketch the functional importance of the various components of an Jet engine. (10 Marks)
- b. Write the difference between four stroke and two stroke internal combustion engines with their advantages and limitation in aircraft application. (10 Marks)

OR

- 2 a. Mention the various components of an ISTRON engine and explain with neat sketch functional importance of each components of an ISTRON engine. (10 Marks)
- b. Explain Brayton cycle with P-V and T-S diagram with advantages of gas turbine engine over reciprocating engines. (10 Marks)

### Module-2

- 3 a. With neat sketch, explain the working of an Turboprop engine with its advantages, disadvantages and thermodynamic cycle. (10 Marks)
- b. Define thrust and derive the thrust equation for turbofan engine. (10 Marks)

OR

- 4 a. What are the different type of propeller used in aircraft and explain propeller selection criteria. (10 Marks)
- b. What is Thrust augmentation? Explain the principle of operation of a after burner with a neat sketch. (10 Marks)

### Module-3

- 5 a. What is the purpose of Inlets in gas turbine engines? Briefly explain supersonic inlets. (10 Marks)
- b. Explain briefly about the starting problem associated with supersonic inlets and explain phenomenon of shock swallowing. (10 Marks)

OR

- 6 a. Explain the following :
  - (i) Internal flow and stallin
  - (ii) Diffusers subsonic inlets.
  - (iii) Boundary layer separation.
  - (iv) Convergent nozzles. (10 Marks)
- b. Explain with a neat sketches :
  - (i) Over expanded and Under expanded nozzles
  - (ii) Ejector with variable area nozzles. (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-4**

- 7 a. Explain with a neat sketch different essential parts of a centrifugal compressor. (10 Marks)  
 b. Define degree of reaction of an axial flow compressor and derive an expression for the same. (10 Marks)

**OR**

- 8 a. Explain the following for an centrifugal compressor :  
 (i) Concept of pre-whirl and rotating stall. (10 Marks)  
 (ii) Performance characteristics of centrifugal compressor.  
 b. Explain the following :  
 (i) Compressor blade design for axial flow compressor. (10 Marks)  
 (ii) Axial compressor performance characteristics.

**Module-5**

- 9 a. Write short notes on :  
 (i) Flame tube cooling. (10 Marks)  
 (ii) Fuel injection  
 (iii) Ignition  
 (iv) Use of Cheaper fuels  
 b. Explain different types of combustion chambers used in gas turbine engines with their advantages and disadvantages. (10 Marks)

**OR**

- 10 a. With neat sketches, explain the working of impulse and reaction stages in turbine with their differentiation. (10 Marks)  
 b. Explain the following :  
 (i) Different types of losses in a turbine. (10 Marks)  
 (ii) Process of Internal cooling of turbine blades.

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