CBCS SCHEME

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17AE43

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 the principles of aircraft propulsion. List down the various types of engines.
(10 Marks)

b. Draw a schematic diagram of a simple gas turbine engine and derive the expression for air standard efficiency with P-V and T-S diagram gas turbine cycle analysis. **(10 Marks)**

OR

2 a. Briefly explain the working principles of internal combustion engine. Write difference between pour stoke engine and two stroke engine. **(10 Marks)**

b. With the help of a neat schematic and P-V and T-S diagram, explain the working principle of a four stoke diesel engine. **(10 Marks)**

Module-2

3 a. List the three theories used in the design of propellers. Explain momentum theory of propeller. **(10 Marks)**

b. Define thrust and derive an expression for thrust equation $F = \overset{\circ}{m}_i \left[(1+t)C_j - C_i \right]$. **(10 Marks)**

OR

4 a. With the help of a neat sketch explain the working principle of an after burner. What are its advantages and disadvantages? **(10 Marks)**

b. Briefly explain the factors affecting thrust. The effective jet exit velocity from jet engine is 2700m/s. The forward flight velocity is 1350m/s and the airflow rate is 78.6kg/s. Calculate: i) Thrust ii) Thrust power iii) Propulsive efficiency. **(10 Marks)**

Module-3

5 a. Explain external flow and derive a relation for minimum area ratio in terms of external deceleration ratio with usual rotations. **(10 Marks)**

b. With the help of a neat sketch, explain the process of shock swallowing in a variable geometers supersonic inlet. **(10 Marks)**

OR

6 a. Write short notes on :
   i) Thrust reverser and thrust vectoring
   ii) Nozzle choking. **(10 Marks)**

b. With the help of a neat sketch, explain over-expanded and under-expanded nozzles. **(10 Marks)**

Module-4

7   a. With the help of a schematic diagram, explain the principle of operation of a centrifugal compressor. **(10 Marks)**
    b. Explain the process of surging and stalling in an axial flow compressor. **(10 Marks)**

OR

8   a. Define and derive expression for degree of reaction of axial flow compressor. **(10 Marks)**
    b. Difference between axial flow compressor and centrifugal compressor. **(10 Marks)**

Module-5

9   a. Explain different types of combustion chamber used in gas turbine engines. Briefly discuss their advantages and disadvantages. **(10 Marks)**
    b. Explain about flame tube cooling and combustion chamber geometry. **(10 Marks)**

OR

10 a. Explain the different methods of cooling turbine blades with relevant sketch. **(10 Marks)**
    b. Explain the working of a single reaction stage with a neat sketch. **(10 Marks)**

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