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10AE55

Fifth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Aircraft Propulsion

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Derive an expression for i) Energy equation ii) Steady flow energy equation **(10 Marks)**

b. List the modes of heat transfers and explain each one of them. **(10 Marks)**

2 a. Explain working principle of turbojet engine with a neat sketch and mention its merits and demerits. **(10 Marks)**

b. Define thrust and derive an expression for thrust equation

$F = \dot{m}_i [(1 + f) c_j - c_i)$

where $\dot{m}_i \rightarrow$ mass flow rate

$f \rightarrow$ fuel – air ratio

$c_j \rightarrow$ Exhaust velocity (exit)

$c_i \rightarrow$ Inlet velocity **(06 Marks)**

c. A turbojet power plant uses aviation kerosene having calorific value of 43 mJ/kg. The fuel consumption is 0.18kg per hour per N of thrust, when the thrust is 9kN, the aircraft velocity is 500m/s the mass of air passing through the compressor is 27kg/S. Calculate the air fuel ratio and overall efficiency. **(04 Marks)**

3 a. Explain subsonic inlets with its nomenclature. Also write a note on typical streamline patterns for subsonic inlet. **(10 Marks)**

b. Briefly explain the supersonic inlets with suitable sketch. **(10 Marks)**

4 a. List and explain important factors affecting combustion chamber design. **(10 Marks)**

b. Explain briefly the following performance coefficients.
i) Nozzle coefficient ii) Cross thrust coefficient iii) Flow coefficient
iv) Velocity coefficient v) Angularity coefficient. **(10 Marks)**

PART – B

5 a. Explain principle of operation of centrifugal compressor with the help of schematic diagram. **(10 Marks)**

b. Explain the effect of impeller blade shape on performance with the help of velocity triangles. **(10 Marks)**

6 a. How do you differentiate between an impulse and a reaction turbine? With a neat sketch explain working of an impulse and a reaction stage. **(10 Marks)**

b. Explain single stage velocity triangle and derive an expression for the work output with neat sketch. **(10 Marks)**

7 a. Explain the working principle of Ramjet engine with the aid of thermodynamic cycle. **(10 Marks)**

b. Explain working principle of scramjet engine with a neat sketch. **(10 Marks)**

8 a. Explain the gas pressurization liquid propellant rocket engine with the help of sketch. **(10 Marks)**

b. How rocket nozzles are classified? Explain briefly. **(10 Marks)**

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