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Fifth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Aircraft Propulsion

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1. a. Give the general classification of power plants used in aircraft. **(07 Marks)**
    b. Define the following: i) Conduction; ii) Convection; iii) Radiation. **(03 Marks)**
    c. It is necessary to insulate a plane wall 2.5m long and 2m high so that the amount of heat flowing per hour through this wall will not exceed 8500kJ. The temperature of wall underneath the insulation is 400°C and the outer surfaces of insulation is at a temperature of 50°C. Determine:
       i) The thickness of insulation layer made of asbestos material of conductivity 0.537 W/mK.
       ii) Temperature gradient of insulation of a distance of 0.05m from the inner surface.
       iii) Temperature gradient of insulation. **(10 Marks)**

2. a. With a neat sketch, explain the working of turbojet engine and also represent it on the thermodynamic cycle. **(08 Marks)**
    b. Air enters a turbojet engine at a rate of 12×10^4 kg/h at 15°C and 1.03 bar and is compressed adiabatically to 182°C and four times the pressure. Product of combustion enter the turbine at 815°C and leave it at 650°C to enter the nozzle. Calculate the isentropic efficiency of the compressor, the power required to drive the compressor, the exit speed of gases and thrust developed when flying at 800km/h. Assume the isentropic efficiency of the turbine is same as that of the compressor and the nozzle efficiency 90%. **(12 Marks)**

3. a. What are the two different types of inlets normally used in a gas turbine engine? Briefly describe their working along with suitable sketches. **(12 Marks)**
    b. Explain the concept of shock swallowing by area variation in supersonic inlets. **(08 Marks)**

4. a. With an appropriate sketch, explain the working of gas turbine combustion chamber and also identify the various zones in it? **(10 Marks)**
    b. What is the use of thrust reversing? Explain the classification of thrust reverser with neat sketch. **(10 Marks)**

PART – B

5. a. A centrifugal compressor takes in gas at 0°C and 0.7 bar and delivers at 1.05bar. The efficiency of the process compared with adiabatic compression is 83%. The specific heat at constant pressure and constant volume are 1.005 and 0.717 respectively. Calculate the final temperature of gas and work done per kg of gas. If the gas were further compressed by passing through a second compressor having the same pressure ratio and efficiency and with no cooling between the two compressors. What would be the overall efficiency of the complete process? **(10 Marks)**

b. Define degree of reaction of an axial flow compressor and derive an expression for the degree of reaction for the compressor. And get the expression for 50% reaction. **(10 Marks)**

6 a. What is the importance of using a turbine in a gas turbine engine? Draw a neat diagram of velocity triangle for a turbine stage and give the expression. **(08 Marks)**

b. With a neat sketch, explain the variation of pressure and velocity in a reaction turbine and also bring out the major differences between an impulse and reaction turbine. **(12 Marks)**

7 a. Explain the working of a Ramjet engine and also highlight its advantages and disadvantages. **(10 Marks)**

b. Describe briefly about the performance characteristics of a ramjet engine based on net thrust and net specific fuel consumption. **(10 Marks)**

8 a. Give the detailed classification of rocket engines. **(08 Marks)**

b. With a neat sketch, explain the operation of a solid propellant rocket and mention its advantages. **(12 Marks)**

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