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JAYA GROUP OF INSTITUTION-THIRUNINRAVUR
4th SEM /6th SEM /8th SEM – B.E. / B.Tech
INTERNAL ASSESSMENT-1(MODEL EXAM-II)

Sub. Name: Propulsion -I
Sub. Code: AE6404
Duration: 180 minutes

Date: 11-03-2016
Branch: Aeronautical
Max.Marks: 100

PART-A (10 x 2 =20)

1. Draw the T-S diagram of inlet operating at low speed high thrust condition of a gas turbine engine.
2. Define degree of reaction.
3. Differentiate between scramjet and ramjet.
4. Define equivalence ratio and stochiometric fuel air ratio.
5. What is the need for varable area nozzle for supersonic operation?
6. What is thrust reversal.
7. Differentiate between impulse and reaction turbine?
8. Define specific impulse.
9. Define match point.
10. What is the prime requirement of an inlet? List out the characteristics of supersonic and subsonic inlets.

PART-B (5x16=80)

11. (a) iperformancewise highlight the requirements of good inlet?draw and explain the streamline pattern of subsonic inlet along with T-S diagram at takeoff and cruise condition (8)

(ii)A jet plane travels with a speed of 285 m/s at an altitude of 6000m where the pressure is 40 Kpa and the temperature is 261 K.diffusser inlet diameter ia 100 cm The air leaves the diffuser of the engine with 100m/s.Determine the temperature and pressure of air leaving the diffuser and the ratio of inlet to exit area of the diffuser,assuming isentropic flow. (8)

Or

(b)i) Explain successive steps in the acceleration and overspeeding of a one dimensional supersonic inlet with sketches. (8)

ii) Explain various types of supersonic inlets and its modes of operations. (8)

12. (a) i) Explain starting problem in case of supersonic inlets. What is shock swallowing by area variation ? (8)

b) Write short notes on:
(i) Ejector and variable area nozzles and
(ii) Thrust reversing (8)

(or)

b) Derive the relation between area ratio Amax / Ai and external deceleration ration ui / ua. (16)

13.a) In a single stage impulse turbine the nozzle discharge the fluid on to the blades atan angle of 55 degrees to the axial direction and the fluid leaves the blades with anabsolute velocity of 350 m/s at an angle of 35 degrees to the axial direction. If theblades have equal inlet and outlet angles and there is no axial thrust, estimate theblade angle, power produced per kg/s of the fluid and blade efficiency

(16)

(Or)

b) . An axial flow turbine has a blade speed at the mean diameter is 300 mps, and massflow is 2.5 kg/s. The gas temperature at turbine inlet and outlet are 500 degrees and 300degrees respectively. The fixed blade outlet angle is 20 degrees measured in the samedirection of U. The axial velocity remains constant at 200 mps. Determine powerdeveloped (16)

14.a) . (i) Discuss the limiting factors in turbine design. (8)

(ii) What are the cooling methods adopted in turbine blades? Explain?. (8)

(Or)

b)i)What are the factors to be considered to select blade profile ,pitch and chord? (10)

ii)Explain intergral ram rocket with a neat sketch. (6)

15.a) (i)Derive the work done for a impulse turbine with velocity triangle . (8)

(ii) Explain the procedure for matching turbine and compressor. (8)

(Or)

b). i) A ramjet engine propels on an aircraft at Mach no = 1.4 and at an altitudeof 6000 m. the diameter of inlet diffuser at the entry is 40 cm and C.V offuel is 43 MJ/kg. The stagnation temperature at the nozzle entry is 1500 K. The properties of combustion gases are same as those of air(γ=1.4 , R=287 J/kg K). Find

i) Efficiency of ideal cycle

ii) Flight speed

iii) Air flow rate

iv) Diffuser pressure ratio

v) Fuel air ratio

vi) Nozzle pressure ratio

vii) Nozzle jet Mach number

viii) Propulsive efficiency

ix) Thrust (16)