

IV B.Tech II Semester Supplementary Examinations, Apr/May 2006
JET PROPULSION AND ROCKET ENGINEERING
(Mechanical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) What are the effects on thermal efficiency and specific output of gas turbine plant due to the following factors
 - i. load on the plant
 - ii. pressure ratio
 - iii. turbine inlet temperature
 - iv. compressor inlet temperature
 - v. regenerator.
- (b) Derive the thermal efficiency of the air standard Brayson cycle. [8+8]
2. (a) Explain the energy flow in an atmospheric thermal jet engine and what are powers corresponding to brake and indicated power of i.c. engines.
- (b) What is the need for thermal jet engines and discuss the applications of thermal jet engines. [8+8]
3. A turbojet engine propels an aircraft at a mach number of 0.8 in level at an altitude of 10 km. The data for the engine is given below
stagnation temperature at the turbine inlet = 1200 K
stagnation temperature rise through the compressor = 175 K,
Calorific value of fuel = 43 MJ/kg.
Compressor efficiency = 0.75
Combustion chamber efficiency = 0.975
Turbine efficiency = 0.81
Mechanical efficiency of the power transmission between turbine and compressor = 0.98
Exhaust nozzle efficiency = 0.97
Specific impulse = 25 seconds
Assuming the same properties for air and combustion gases calculate.
 - (a) fuel - air ratio
 - (b) compressor pressure ratio
 - (c) Turbine pressure ratio
 - (d) Exhaust nozzle pressure ratio
 - (e) Mach number of exhaust jet. [16]
4. (a) Draw the neat sketch of a supersonic diffuser for a ramjet engine with oblique and normal shocks.

- (b) Depict variation of the static pressure through the diffuser from its entry to exit. [8+8]
5. Define and explain the terms :
- (a) Thrust
 - (b) Thrust power
 - (c) Effective jet exit velocity
 - (d) Propulsive efficiency related to rocket engines? [16]
6. What do you understand from monopropellant fuels? What are the merits and demerits over the bipropellant fuels used in rocket engines? [16]
7. Describe briefly with the aid of graphs, the variation of the following quantities in rocket propulsion.
- (a) Rocket thrust with altitude.
 - (b) Thrust coefficient Vs Exhaust nozzle pressure ration P_o/P_c
 - (c) Thrust coefficient Vs area ratio of exhaust nozzle.
 - (d) Acceleration due to gravity Vs altitude. [4×4]
8. (a) Give the classification of liquid propellant rocket engines.
- (b) With the help of a neat diagram, explain the working of a liquid bi-propellant rocket engine. [8+8]

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