



12. (a) A supersonic diffuser, diffuses air in an isentropic flow from a Mach number of 3 to a Mach number of 1.5 the static conditions of air at inlet are 70 kPa and  $-7^{\circ}\text{C}$ . if the mass flow rate of air is 1.25 kg/s determine
- (i) Stagnation conditions.
  - (ii) Area at throat and exit.
  - (iii) Static conditions of air at exit. (13)

Or

- (b) Explain the various methods of thrust reversing. (13)
13. (a) Explain the working of typical combustion chamber with neat sketch. (13)

Or

- (b) (i) Briefly explain the methods of Flame stabilization with suitable sketch. (8)
- (ii) Explain flame holders and its types. (5)
14. (a) An axial compressor stage has mean diameter 600 mm and runs at 250 rps. The actual temperature rise is  $30^{\circ}\text{C}$  and pressure ratio developed is 1.35. Initial temperature is  $35^{\circ}\text{C}$  and temperature rise in the rotor is  $20^{\circ}\text{C}$ . Mass flow rate is 50 kg/s and mechanical efficiency is 85%. Determine,
- (i) Power required to drive the compressor
  - (ii) Loading co-efficient
  - (iii) Degree of reaction
  - (iv) Stage efficiency. (13)

Or

- (b) Illustrate the working principle of centrifugal compressor with neat sketch. (13)
15. (a) Explain the performance of axial flow turbines in detail. (13)

Or

- (b) Briefly explain the design considerations that has to be followed while designing axial turbine blades. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Briefly discuss the factors affecting the design of the combustion chamber.

Or

- (b) A flight speed of a turbojet is 800 kmph at 10000 m altitude. The density of air at that altitude is  $0.17 \text{ kg/m}^3$ . The Thrust for a plane is 6.8 KN. The propulsive efficiency of the jet is 60%. Calculate SFC, ratio of mass flow rate of air and fuel, jet velocity. Assume the calorific value of fuel is 45 MJ/KG and overall efficiency is 18%.