

GUJARAT TECHNOLOGICAL UNIVERSITY**B. E. - SEMESTER – VI • EXAMINATION – WINTER 2012****Subject code: 160102****Date: 03/01/2013****Subject Name: Fundamentals of Jet Propulsion****Time: 02.30 pm - 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain solid rocket motor thrust chamber cooling 07
(b) Derive Euler's fundamental equation for turbo machines 07

- Q.2** (a) Explain and list differences between positive displacement machines and turbo machines 07
(b) Explain starting problems in supersonic inlets and how to overcome starting problem? 07

OR

- (b) How diffuser performance in terms of pressure recovery and efficiency can be evaluated? Explain in detail 07

- Q.3** (a) Compare performance of turboprop, turbojet and turbofan engine in terms of velocity, altitude, efficiencies and thrust variation 07
(b) Derive thrust equation for turbofan engine 07

OR

- Q.3** (a) What are different thrust augmentation techniques which increase the mass flow rate and hence thrust during augmentation? 07
(b) What do you understand by air breathing and non-air breathing propulsion system? Explain each with one example and their working with neat sketches 07

- Q.4** (a) Define: 1. Equivalence ratio, 2. Combustion loading parameter, 3. Space heat release rate, 4. Reaction rate parameter, 5. Cooling effectiveness, 6. Pattern factor, 7. profile factor 07
(b) Explain optimum expansion, under expansion and over expansion nozzle with suitable diagram 07

OR

- Q.4** (a) Explain types and properties of materials used for gas turbine combustion chamber 07
(b) Why actual mass flow rate through nozzle is more than theoretical mass flow rate? Also explain different equilibrium conditions of nozzle. 07

- Q.5** (a) Explain Ramjet engine working with operating cycle with schematic diagram. Derive equation for efficiency and pressure ratio 07
(b) Give selection criteria of liquid propellant engine 07

OR

- Q.5** (a) Explain in detail any two thrust vectoring control techniques used in solid rocket motor. 07
(b) Derive equation for exhaust velocity from first principle 07
