Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institute of Manipal University, Manipal

VII SEMESTER B.TECH (MECHANICAL ENGG.) END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: JET PROPULSION AND ROCKET TECHNOLOGY [MME 449]

REVISED CREDIT SYSTEM

Time: 3 Hours **30-11-2016** MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A. Derive an expression for thrust equation of a gas turbine and hence thrust power. **3**

1B. Explain the importance of an inlet diffuser in a gas turbine system with a neat sketch. **3**

1C. What is meant by Thrust Augmentation in gas turbine engines? Discuss the three methods of Thrust Augmentation. **4**

2A. Explain Ideal Brayton cycle with intercooling, reheating and regeneration. **4**

2B. An aircraft using a simple turbojet engine, flies at Mach 0.8 where the ambient temperature and pressure are 223.3 K and 0.265 bar, respectively. The compressor pressure ratio is 8.0 and the turbine inlet temperature is 1200 K. The isentropic efficiencies of: compressor = 0.87, turbine = 0.90, intake = 0.93, nozzle = 0.95, mechanical = 0.99, combustor = 0.98. The pressure loss in the combustor = 4% of compressor delivery pressure. Determine the thrust and specific fuel consumption. **6**

3A. Derive expressions for thermal, propulsive and overall efficiency of a rocket. **6**

3B. Derive the effective exhaust velocity ‘C’ of a rocket nozzle and explain Over-expanded, Under-expanded and Ideally expanded nozzle configurations with neat sketches. **4**

4A. What are the desired characteristics of a solid propellant? **3**

4B. Explain the two methods of holding the grain in a solid propellant rocket with neat sketches. **4**

4C. With a neat sketch, explain the working of a liquid propellant system employing a gas pressure feed system. **3**

5A. What are gelled propellants? Give its advantages and disadvantages. **3**

5B. Write short notes on aging of propellants. **3**

5C.	With a neat sketch, explain the working of a hybrid rocket giving its advantages.	**4**
6A.	Explain the working of an Arcjet electrical rocket with a neat sketch.	**3**
6B.	Explain the working of Solar thermal rocket with a neat sketch.	**3**
6C.	Explain the working of Electron Bombardment Thruster with a neat sketch.	**4**