Code No: 56072 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, December - 2017
AEROSPACE PROPULSION-II
(Aeronautical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
\- - -

1. A missile has a maximum flight speed to jet speed ratio of 0.45 and specific impulse equal to 260 seconds .Determine the following for a burn out time of 10 seconds.
   a) Effective jet velocity
   b) Mass ratio and propellant mass functions
   c) Maximum flight speed, and
   d) Altitude gain during powered and coasting flights [15]

2.a) Discuss the problems associated with supersonic combustion and how to overcome it?
   b) An ideal ramjet engine operates with isentropic diffusion, no total pressure reduction in the engine, a choked isentropic converging nozzle and k=1.4 constant, Calculate the values of effective jet Mach number M_j for M_0 =1.0, 1.4, 1.8, 2.2 and infinity. [7+8]

3.a) A rocket flies at 10,080 km/hr with an effective exhaust jet velocity of 1400 m/s and propellant flow rate 5 Kg / s. If the head of reaction of the propellant is 6500 KJ / Kg of the propellant mixture determine:
   i) Propulsion efficiency and propulsion power
   ii) Engine output and thermal efficiency
   iii) Overall efficiency
   b) With a neat sketch derive fundamental thrust equation of a rocket. Explain the basic operating principle of a rocket. [9+6]

4.a) Draw a neat sketch of a Turbo pump feed system employed in liquid rocket engines.
   b) How does cavitation occurs in this system and what measures are taken to prevent it? [7+8]

5.a) How is regressive, neutral and progressive burning of the solid propellant grown achieved? Explain with the aid of diagram.
   b) What is adiabatic flame temperature? How it is estimated in a solid propellant rocket motor? [8+7]

6. Draw neat sketches, explaining the general working of the following Electric propulsion systems. [8+7]
   a) Microwave thermal propulsion
   b) Arc jet electric propulsion.

7.a) List out the potential applications of nuclear engines. What are the basic operational issues involved with nuclear propulsion system?
   b) Differentiate between chemical and nuclear rockets. [8+7]

8.a) Explain the need for advanced propulsion system for space applications. Describe the concept of superconductor gravitational shielding with neat sketches.
   b) Write a short note on Radio isotope rocket and nuclear fission rocket. [9+6]

---ooOoo---