Roll No……..….. **Total No. of Printed Pages: 1**

Total No. of Questions: [09]

B. Tech. (Aeronautical Engg.) (Semester – 7th)
JET PROPULSION
Subject Code: BANED1-711
Paper ID: [18110242]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:
a) What is Rayleigh Flow?
b) For subsonic flow through divergent nozzle what is the exit velocity?
c) What are the components of a ramjet engine?
d) Draw thermodynamic cycle of a gas turbine engine.
e) What do you mean by twin spool engine?
f) What is work done factor in centrifugal compressor?
g) What is degree of reaction?
h) What is critical area in a nozzle?
i) What is the pressure variation in a combustion chamber?
j) What is an axial flow turbine?

Section – B **(5 marks each)**

Q2. What is a shock wave and where does it exist?
Q3. Describe Brayton cycles for gas turbine engine.
Q4. Draw the pressure variation across a nozzle at different back pressures.
Q5. Describe the working of a combustion chamber.
Q6. How compressor and turbines are matched?

Section – C **(10 marks each)**

Q7. A symmetrical blading axial flow compressor has an airflow with axial velocity of 145 m/s. The blading is designed for 50% reaction at mean diameter. Pressure ratio is 1.5 and isentropic efficiency is 86 %. Assuming that the flow is of Vortex type, estimate the degree of reaction at the root and tip of the blade, if the ratio of inside diameter to outside diameter is 0.75. The inlet conditions to compressor correspond to standard state sea level.

Q8. The overall air to fuel ratio for a turbojet is 70:1 and the engine flies at a Mach number of 1.78 at a certain altitude where the free stream temperature is 245 k. The exhaust gas temperature is 623 k and the exit mach number of the jet nozzle is 2.34. Estimate the thrust specific fuel consumption. Assuming a total airflow rate of 67 kg/s, estimate the thrust developed by the engine

Q9. Explain the functioning of convergent nozzles with diagram? What is Nozzle Choking? Why does it happen?