Code: 15A03805 **R15**

B.Tech IV Year II Semester (R15) Advanced Supplementary Examinations July 2019

GAS TURBINES & JET PROPULSION

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) What are the applications of gas turbines?
(b) List the advantages of closed cycle gas turbine system over open cycle system.
(c) What are the different methods used to improve the efficiency of gas turbine plant?
(d) Explain the significance of intercooler. What is meant by perfect intercooling?
(e) Why are propeller engines not commonly used nowadays in aircrafts?
(f) State the difference between air breathing and non-air breathing propulsion systems.
(g) Define thrust power and propulsive power.
(h) What is propellant? How are propellants classified?
(i) Explain about free radical propulsion.
(j) What is meant by thrust and its limiting factors?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 A Brayton cycle works between 1 bar, 300 K and 5 bar, 1250 K. There are two stages of compression with perfect intercooling and two stages of expansion. The work out of first expansion stage being used to drive two compressors, where the inter stage pressure is optimized for the compressor. The air from the first stage turbine is again heated to 1250 K and expanded. Calculate the power output of free power turbine and cycle efficiency without and with heat exchanger and compare them. Also calculate improvement in the efficiency.

OR

3 Explain with neat sketch the working operators of air standard Brayton cycle.

UNIT – II

4 Define isothermal efficiency of the compressor and prove that the isothermal work input to a compressor is always minimum.

OR

5 Sketch the neat diagram of regenerative gas turbine plant and deduce an expression for its thermal efficiency.

UNIT – III

6 (a) Explain the various efficiencies associated with a propulsion device.
(b) The effective jet exit velocity from a jet engine is 2700 m/s. The forward flight velocity is 1350 m/s and the air flow rate is 78.6 kg/s. Calculate: (i) Thrust. (ii) Thrust power. (iii) Propulsive efficiency.

OR

7 What is meant by thrust augmentation and thrust reversal and explain any one method of thrust augmentation in detail?

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UNIT – IV

8 With aid of suitable schematic diagram, explain the working principle of Ram Jet engine and mention the various advantages and disadvantages of Ram jet engine compared to other.

OR

9 Explain the requirements of a liquid propellant and its advantages over solid propellant rockets.

UNIT – V

10 What is meant by staging? Explain why multi-staging is required.

OR

11 Explain the need of Cryogenics in propulsion systems.

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