

B.Tech IV Year II Semester (R15) Regular Examinations April 2019

GAS TURBINES & JET PROPULSION

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- (a) What are the advantages of reciprocating engines over gas turbines?
 - (b) Explain the principle of Air Standard Brayton cycle.
 - (c) Write the assumptions made in an ideal cycle analysis of gas turbines.
 - (d) Define isentropic efficiency of a compressor and turbine of gas turbine plant.
 - (e) State the difference between jet propulsion and rocket propulsion.
 - (f) How jet propulsions are classified?
 - (g) Why does a ramjet engine not require a compressor or turbine?
 - (h) What are the various types of oxidizers used in rockets?
 - (i) What are desirable requirements of liquid propellant rockets?
 - (j) List the applications of the rockets.

PART – B
(Answer all five units, 5 X 10 = 50 Marks)**UNIT – I**

- 2 Air enters the compressor of a gas turbine plant operating on air standard cycle at 100 kPa and 300 K with a volumetric flow rate of 5 m³/sec. The compressor pressure ratio is 10. The turbine inlet temperature is 1400 K, the turbine and compressor each has an isentropic efficiency of 80%. Calculate: (i) Thermal efficiency of the cycle. (ii) The back-work ratio.

OR

- 3 Discuss and compare the features of closed cycle and open cycle gas turbines with neat diagrams.

UNIT – II

- 4 Draw the schematic diagram of a simple cycle with intercooler and explain briefly the working principle. Draw also p-v and T-s diagrams of the cycle.

OR

- 5 Show that the specific work output is maximum when the pressure ratio is such that the compressor outlet and turbine outlet temperatures are equal.

UNIT – III

- 6 Explain the principle of after burner in thrust augmentation, draw the performance chart of an after-burner engine.

OR

- 7 The diameter of the propeller of an aircraft is 2.5 m. It flies at a speed of 540 km/h at an elevation of 8000 m, where air density is 0.525 kg/m³. The flight to jet speed ratio is 0.75. Calculate: (i) The air flow rate through the propeller. (ii) Thrust produced. (iii) Specific impulse. (iv) Thrust power.

UNIT – IV

- 8 Draw the thermodynamic cycle of the Ramjet engine and derive the equation for thrust.

OR

- 9 Explain briefly about propellants and their desirable characteristics in detail.

UNIT – V

- 10 What are the advantages and disadvantages of multi stage rockets?

OR

- 11 Explain briefly about Advanced Propulsion Systems.
