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R15

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)

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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 m^3/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/m^3. 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.

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