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Register No: …… Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

EIGHTH SEMESTER B.TECH. DEGREE EXAMINATION(R), MAY 2024

Mechanical Engineering

(2020 SCHEME)

Course Code : 20MET446

Course Name : Gas Turbines and Jet Propulsion

Max. Marks : 100 **Duration:3 Hours**

Scientific calculator and statistical table is allowed in the examination hall.

PART A

(Answer all questions. Each question carries 3 marks)

1. Define Mach number.
2. Write the continuity eqaution for one dimensional steady state compressible flow.
3. List all the processes of an ideal Brayton cycle.
4. Explain intercooling in gas turbine systems.
5. What are compressor characteristics ?
6. List the factors lowering the volumetric efficiency of a compressor.
7. List the factors influenecing the design of combustor in a jet engine.
8. Explain the process of combustion in jet engnies.
9. Write short note on "propulsion efficiency"
10. Explain "air breathing" propulsion systems.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. Deduce the expressions for the following terms with regard to compressible flow. 14
a)Stagnation enthalpy b) Stagnation temperature c)Stagnation velocity of sound d) Stagnation density

OR

12. The pressure,temeprature and mach number at the entry of a flow passage are 2.45 bar,26.5 degree C and 1.4 respectively. If the exit mach number is 4.0, determine for adiabatic flow of a perfect gas(γ = 1.3,R=0.469Kj/kgk) 14
(i) stagnation temeprature (ii) temeprature and velocity of gas at exit (iii) the flow rate per square meter of inlet section

MODULE II

13. With the help of necessary diagrams derive an expression for thermal efficiency of a brayton cycle. 14

OR

14.	An air-standard Brayton cycle operates with 1000 kPa and 350 K at the compressor inlet. The compressor pressure ratio is 10. The maximum temperature is 1700 K. On the basis of a cold air-standard analysis, using Cp = 1.005 kJ/kgK, determine the thermal efficiency.	14

MODULE III

15.	With suitable sketches explain the working of a reciprocating compressor.	14

OR

16.	A reciprocating air compressor has cylinder with 24 cm bore and 36 cm stroke. Compressor admits air at 1 bar, 17 degree C and compresses it up to 6 bar. Compressor runs at 120 rpm. Considering compressor to be single acting and single stage, determine mean effective pressure and the horse power required to run compressor when it compresses following the isothermal process and polytropic process with index of 1.3. Also find isothermal efficiency when compression is of polytropic and adiabatic type.	14

MODULE IV

17.	With neat sketches explain the following performance parameters related to the combustion process in jet engines. a) Pressure loss b) combustion efficiency c) stability loop d) combustion intensity	14

OR

18.	List and explain about the genesis and formation of any 3 types of pollutants emitted during the combustion in jet engines.	14

MODULE V

19.	With suitable examples explain about solid and liquid propellants used for jet propulsion. Describe how specific impusle is calculated.	14

OR

20.	With neat sketches explain the principle of Rocket propulsion.	14

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