GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

SM19002060

Registration No: | | | | | | | | | | |

Total Number of Pages : 1 **M.TECH**

M.TECH 2ND SEMESTER (AR 17) SUPPLEMENTARY EXAMINATIONS, APRIL/MAY 2019

GAS TURBINE AND JET PROPULSION

Branch: TE, Subject Code:MTEPE2043

Time: 3 Hours **Max Marks : 70**

PART-A **(10 X 2=20 MARKS)**

1. Answer the following questions.

a) Define compressor work.
b) Write two methods to improve the thermal efficiency of simple gas turbine plant.
c) Write steady flow energy equation for the turbine of Gas turbine power plant.
d) Define Effectiveness of Heat Exchanger.
e) Define Degree of reaction of compressor.
f) Write down difference between radial flow and axial flow of turbine.
g) Write down simple thrust equation for propelling a gas turbine.
h) What is propulsive efficiency.
i) Define TPSFC.
j) Define various losses in centrifugal compressor.

PART-B **(5 X 10=50 MARKS)**

Answer any five questions from the following.

2. a) A closed cycle gas turbine operates a pressure ratio of 6 The inlet air enter into compressor with a pressure of 1 bar and temperature of 27^0 C Maximum temperature of cycle is 577^0C . Calculate net work done and efficiency of cycle [5]
   b) Explain with neat sketch of T-S plot how turbine work increase with using reheater. [5]
3. a) A gas turbine power plant operates at a mass flow rate of 30 Kg/sec. Air enters into compressor at a pressure of 1 bar and temperature 15^0C . Discharge pressure from compressor is 10.5 bar. Combustion occurs at constant pressure and the temperature reach to 710^0C . Exhaust gas leaves from the turbine at pressure 1.2 bar. Determine net work done and thermal efficiency of cycle. [5]
   b) What is turbine efficiency and compressor efficiency in actual Brayton cycle [5]
4. In a gas turbine plant air enters into compressor at 1 bar and 7^0C. Air gets compressed to 4 bar with an isentropic efficiency of 82%. The maximum temperature at the inlet to turbine is 800^0C . The isentropic efficiency of the turbine is 85%. The calorific value of fuel is 43.1 MJ/kg. Calculate Net work done , Thermal efficiency and air-fuel ratio. [10]
   Assume C_{pg} =1.153 Kj/KgK
5. a) The effective jet exit velocity from a jet engine is 2700 m/sec. The forward flight velocity is 1350 m/sec and the air flow rate is 78.6 kg/sec. calculate thrust power and propulsive efficiency. [5]
   b) Explain the principle of bleed burn cycle for thrust augmentation. [5]
6. a) A centrifugal compressor has an inlet diameter 15 cm. The impeller revolves at 20000 rpm and the inlet air has an axial velocity of 107 m/sec. Inlet stagnation temperature 294 K and inlet pressure 1.03 kg/cm^2. Calculate theoretical angle of the blade and Mach number at the tip. [5]
   b) Draw and explain inlet and exit velocity triangle of impeller blades of centrifugal compressor. [5]
7. a) Prove that Degree of reaction of a axial flow compressor is [5]
   $R = 0.5 – 0.5 (V/u) (\tan \alpha_1 - \tan\beta_2)$ [5]
   b) Draw enthalpy and entropy diagram for a flow through single stage reaction turbine.
8. Write short notes on :
   a) Blade stage efficiency [5]
   b) Turbo Jet engine [5]

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