

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III (New) EXAMINATION – WINTER 2019

Subject Code: 3132504

Date: 30/11/2019

Subject Name: Basic and Applied Thermodynamics

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

	Marks
Q.1 (a) Define following terms. 1) Thermodynamics 2) System 3) Process	03
(b) Explain Zeroth law of thermodynamics with the help of suitable example.	04
(c) Apply first law of thermodynamics to steady flow process and derive steady flow energy equation.	07
Q.2 (a) Give statements of following terms in thermodynamics. 1) First law of thermodynamics 2) second law of Thermodynamics 3) Entropy	03
(b) Discuss Concept of PMM1 and PMM2.	04
(c) Fluid enters a nozzle with a velocity 50 m/s and initial enthalpy is 3000 kJ/kg. The Enthalpy of fluid at the exit of nozzle is 2700kJ/kg. Assume that the no heat interaction between nozzle and surroundings. (assume change in potential energy is negligible) Calculate 1) Velocity of fluid at exit of nozzle. 2) The mass flow rate when inlet area is 0.1m^2 and specific volume at inlet is $0.2\text{m}^3/\text{kg}$.	07
OR	
(c) A Carnot engine receives 5000kJ heat from a heat source at 427°C and rejects heat to atmosphere at 27°C . Calculate the thermal efficiency of engine and work produced by engine. If engine is irreversible and efficiency of this irreversible engine is 75% of Carnot engine, find the percentage change in heat rejection for the same heat input and temperature limits.	07
Q.3 (a) Show that violation of Kelvin plank statement leading to violation of Clausius statement.	03
(b) Differentiate Carnot and Rankine Cycle.	04
(c) Determine expression for air standard efficiency of Otto cycle with neat sketch of P-V and T-S diagram.	07
OR	
Q.3 (a) Describe entropy change for irreversible process.	03
(b) Differentiate auto and Diesel cycle.	04
(c) Determine expression for efficiency of Rankine cycle with neat sketch of their main components, P -V and T-S diagram.	07
Q.4 (a) Describe refrigeration effect and one tone of refrigeration	03

- (b) Differentiate refrigerator, heat pump and heat engine using suitable diagram. **04**
- (c) Carnot cycle works on steam between the pressure limits of 7MPa and 7KPa. Determine the thermal efficiency, turbine work and compression work per kg. of steam. **07**
 Take enthalpy and entropy for 70 bar pressure as bellow.
 $h_1 = h_{f1} = 1267.4$ kJ/kg.
 $S_1 = S_{f1} = 3.1219$ kJ/kg K.
 $h_2 = h_{g2} = 2773.5$ kJ/kg.
 $S_2 = S_{g2} = 5.8162$ kJ/kg K.

OR

- Q.4** (a) Describe reverse Carnot cycle and give its limitations. **03**
- (b) Explain flow diagram of simple vapor compression refrigeration system. **04**
- (c) An engine operating on diesel cycle has maximum pressure and temperature of 45 bar and 1500⁰C. Pressure and temperature at beginning of compression are 1 bar and 27⁰C. Determine air standard efficiency of cycle take $\gamma = 1.4$ for air. **07**
- Q.5** (a) Show different processes of joule cycle on P – V and T – S diagram. **03**
- (b) Illustrate working of impulse turbine with neat sketch. **04**
- (c) List out methods of steam turbine compounding and explain any one with neat sketch in detail. **07**

OR

- Q.5** (a) Show different processes of diesel cycle on P – V and T – S diagram. **03**
- (b) Illustrate working of reaction turbine with neat sketch. **04**
- (c) List out methods for governing of steam turbine and explain any one with neat sketch in detail. **07**
