R17 Regulation *Subject code: 1P3CB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech II Year I Semester Regular Examinations, December 2018

THERMODYNAMICS

(Mechanical Engineering)

Maximum Marks: 70 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks **(10x2M=20 Marks)**

1 What is meant by isolated System?
2 Define Thermodynamic Equilibrium
3 Write the Corollary of Carnot's Theorem
4 Discuss the Clausius and Kelvin plank statements.
5 What is Triple point?
6 What is meant by the Internal Energy of Steam?
7 What is Dew point temperature (DPT)?
8 Write the purpose of Dalton's Law.
9 Draw the pv , TS diagram of Otto cycle.
10 Define Co-efficient of Performance (C.O.P.)

Part-B

Answer All the following questions. **(10M X 5=50Marks)**

11 Explain the followings
a) Energy, Work and Heat (5M)
b) Comparison of Heat and Work (5M)

OR

12 a) Define a thermodynamic system. Differentiate between open system, closed system and an isolated system. (5M)
b) Differentiate microscopic and macroscopic approaches. (5M)

13 a) A cyclic heat engine operates between a source temperature of 1000°C and a sink temperature of 40°C. Find the least rate of heat rejection per kW net output of the engine? (5M)
b) Derive the efficiency of reversible heat engine. (5M)

OR

14 Derive the Maxwell relations and explain their importance in thermodynamics. (10M)

15 Explain the p-T and p-V-T (Pressure-Volume-Temperature) diagram for pure substances (10M)

OR

16 A vessel having a capacity of 0.05 m^3 contains a mixture of saturated water and saturated steam at a temperature of 245°C. The mass of the liquid present is 10 kg. Find the following : (10M)

(i) The pressure, (ii) The mass,(iii) The specific volume, (iv) The specific enthalpy, (v) The specific entropy, and (vi) The specific internal energy.

17 A mixture of hydrogen (H_2) and oxygen (O_2) is to be made so that the ratio of H_2 to O_2 is 2 : 1 by volume. If the pressure and temperature are 1 bar and 25°C respectively, calculate : (i) The mass of O_2 required ; (ii) The volume of the container. (10M)

OR

18 Explain the following psychrometric processes briefly. (10M)
i) Sensible heating and Sensible cooling, ii) Cooling and dehumidification
iii) Cooling and humidification iv) Heating and dehumidification v). Heating and humidification.

19 Derive an expression for air standard efficiency of diesel cycle. (10M)

OR

20 a) What are the advantages of using an expansion valve instead of an expander in a vapour compression refrigeration cycle? (3M)

b) A simple vapour compression plant produces 5 tonnes of refrigeration. The enthalpy values at inlet to compressor, at exit from the compressor, and at exit from the condenser are 183.19, 209.41 and 74.59 kJ/kg respectively. Estimate : (i) The refrigerant flow rate, (ii) The C.O.P., (iii) The power required to drive the compressor, and (iv) The rate of heat rejection to the condenser (7M)