



B.Tech III Semester Regular Examinations, February 2022

THERMODYNAMICS
(MECHANICAL ENGINEERING)

Maximum Marks: 70

Date: 24.02.2022 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 thermodynamic system?
- 2 Define thermometry.
- 3 State Clausius & Kelvin Planck statement of second law of thermodynamics.
- 4 Define third law of thermodynamics.
- 5 Define a Pure substance. Give examples.
- 6 Define universal gas constant.
- 7 What is compressibility chart?
- 8 Define Mass fraction and Mole fraction.
- 9 Define mean effective pressure.
- 10 Sketch P-V and T-S diagram of diesel cycle and name the processes.

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 Sketch and explain working of constant volume gas thermometer. 10M
- OR
- 12 (a) What are reversible and irreversible processes. State causes of irreversibility. 5M
(b) Explain thermodynamics from Macroscopic and Microscopic point of view. 5M
- 13 Prove the equivalence of Clausius and Kelvin Planck statements of second law of thermodynamics. 10M
- OR
- 14 (a) Derive Clausius Inequality and state its significance. 5M
(b) What are Maxwells relations. 5M
- 15 (a) Sketch and explain P-V-T surface diagram. 5M
(b) Write Clausius & Clapeyron equation and state its significance. 5M
- OR
- 16 (a) Explain throttling and free expansion processes. 5M
(b) Define (i) Triple point of water (ii) Dryness fraction. 5M

- 17 A gas mixture contains one kg of oxygen and 3.5 kg of Nitrogen. The pressure and temperature of the mixture are 1 bar and 27°C. Determine 10M
- (i) Mass fraction and Mole fraction of each element
 - (ii) Average molecular weight of the mixture
 - (iii) Partial pressure of the constituents.
- OR
- 18 (a) Discuss the phenomenon variable specific heat. 5M
(b) Explain Dalton's law of partial pressure. 5M
- 19 Compare Otto, Diesel and Dual combustion cycle. 10M
- OR
- 20 (a) Sketch P-V and T-S diagram of Sterling cycle. 5M
(b) Calculate thermal efficiency of an Otto cycle working with maximum temperature of 1400°C and minimum temperature of 42°C. If the compression ratio is 10 and pressure of air at the beginning of the compression is 1.5 bar, then estimate the mean effective pressure. 5M