

Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 1 – EXAMINATION SUMMER 26_SP

Subject Code: 3110006

Date: 18-07-2026

Subject Name: Basic Mechanical Engineering

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

- Q.1** (a) Give statements of zeroth law and first law of thermodynamics **03**
(b) Write a short note on Biofuels **04**
(c) Explain with schematic arrangement the working of vapor compression refrigeration system . **07**

- Q.2** (a) Write a short note on global warming **03**
(b) Differentiate between positive displacement and dynamic type air compressors **04**
(c) Explain with neat sketch working of Babcock Wilcox type steam boiler **07**

OR

- Q.2** (c) Differentiate between mountings and accessories of steam boiler. State location and function of any two mountings and any two accessories of steam boilers **07**

- Q.3** (a) Define following terms related to steam **03**
i) Dryness Fraction ii) Degree of super heat iii) Enthalpy of evaporation
(b) Define isothermal process. Derive the expression for work done and heat transfer for the process **04**
(c) The initial volume of 0.18 kg of a certain gas was 0.15 m^3 at a temperature of 15°C and a pressure of 1 bar . After adiabatic compression to 0.056 m^3 the pressure was found to be 4 bar . Find : **07**
i) Gas constant ii) Molecular mass of the gas iii) Ratio of specific heats
iv) Two specific heats at a constant pressure and the other at constant volume
v) Change of internal energy

OR

- Q.3** (a) State Boyle's, Charle's and Avogadro law. **03**
(b) Determine the condition of steam in the following cases **04**
i) At a pressure of 10 bar and temperature 200°C
ii) At a pressure of 10 bar and volume of $0.175 \text{ m}^3/\text{kg}$. Steam table data is as shown below :

Pressure (Bar)	Saturation Point Temperature (° C)	Specific Volume (m^3/kg)
10	179.9	0.1943

- (c) Explain with neat sketch working of combined separating and throttling calorimeter **07**
- Q.4** (a) Differentiate between internal and external types of heat engines. **03**
- (b) An engine working on the Otto cycle has a diameter of 150 mm and a stroke of 225 mm. The clearance volume is $1.25 \times 10^{-3} \text{ m}^3$. Find the air standard efficiency of this cycle **04**
- (c) Differentiate between **07**
 i) Petrol and diesel engines
 ii) Two stroke and four stroke types of internal combustion engines
- OR
- Q.4** (a) State the function of i) Carburetor ii) Fuel Injector iii) Cam shaft in case of internal combustion engines **03**
- (b) An engine uses 6.5 kg of oil per hour of calorific value 30000 kJ/kg. If the brake power of the engine is 22 kW and mechanical efficiency 85% calculate **04**
 i) Indicated thermal efficiency
 ii) Brake thermal efficiency
 iii) Specific fuel consumption in kg/B.P//Hr
- (c) Derive the formulae for air standard thermal efficiency of Diesel cycle **07**
- Q.5** (a) Explain with neat sketch working of gear pump **03**
- (b) Discuss the following materials with application and properties: (i) Glass (ii) Ceramic **04**
- (c) Using neat sketch explain the working of block brake and internal expanding shoe brake. **07**
- OR
- Q.5** (a) Explain with neat sketch working of any one rotary positive displacement type air compressor **03**
- (b) Define following mechanical properties: **04**
 i) Hardness ii) Toughness iii) malleability iv) creep
- (c) Explain with neat sketch i) Spur Gears ii) Helical Gears iii) Bevel Gears and state their application. **07**
