

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 7 – EXAMINATION – SUMMER 2026

Subject Code: 3171923

Date: 08/06/2026

Subject Name: Internal Combustion Engine

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.**
- 4. Simple and non-programmable scientific calculators are allowed.**

- Q.1**
- (a) Explain the thermodynamic differences between SI and CI engines. **03**
 - (b) Compare the performance characteristics and applications of SI and CI engines. **04**
 - (c) In an ideal constant volume cycle the pressure and temperature at the beginning of compression are 97 kN/ m² and 40 °C respectively. The volume ratio of compression is 7:1. The heat supplied during the cycle is 1200 K J/Kg of working fluid. Determine the maximum temperature attained in the cycle, thermal efficiency of cycle and work done during the cycle/ Kg of working fluid. **07**
- Q.2**
- (a) Explain the functions of fuel pumps and injectors. **03**
 - (b) Discuss spray formation of diesel injection and factors affecting it. **04**
 - (c) Explain various types of injection systems used in CI engines with a diagram. **07**
- OR
- Q.2**
- (c) Describe the working of a simple carburetor with a neat sketch and discuss mixture strength variation. **07**
- Q.3**
- (a) What are the stages of combustion in SI engines? **03**
 - (b) Explain the methods used to control knocking in SI engines. **04**
 - (c) A gasoline engine working on four stroke develops a brake power of 20.9 kW. A Morse Test was conducted on this engine and the brake power (kW) obtained when each cylinder was made inoperative by short circuiting the spark plug are 14.9, 14.3, 14.8 and 14.5 respectively. The test was conducted at constant speed. Find: (i) the indicated power, (ii) mechanical efficiency and (iii) bmep when all the cylinders are firing. The bore of the engine is 75 mm and the stroke is 90 mm. The engine is running at 3000 rpm. **07**
- OR
- Q.3**
- (a) Describe stages of combustion in CI engines. **03**
 - (b) Write short notes on detonation and its controlling factors in CI engines. **04**
 - (c) A six cylinder, four-stroke gasoline engine having a bore and stroke of 100 mm has a compression ratio 8. The relative efficiency is 54% when the indicated specific fuel consumption is 300 gm/kWh. Determine: (i) the calorific value of the fuel and (ii) corresponding fuel consumption, given that imep is 8.5 bar and speed is 2550 rpm. **07**
- Q.4**
- (a) Explain the sustainability and ethical concerns in engine emission control. **03**
 - (b) Explain suitability of Biofuels as alternative fuel in I.C engines. **04**

- (c) List major exhaust emissions from SI and CI engines. Also explain emission control measure require for IC engine. **07**

OR

- Q.4** (a) Discuss the impact of emission legislation on engine design. **03**
(b) Explain the advantages of using hydrogen as a fuel in IC engines. **04**
(c) Explain the effect of engine maintenance on exhaust emissions. Also compare diesel and gasoline emissions. **07**

- Q.5** (a) Explain the working principle of a Wankel engine. **03**
(b) Explain air box method to calculate the air consumption in an engine. **04**
(c) Discuss MPFI systems and their advantages over carburetor systems. **07**

OR

- Q.5** (a) Explain the working principle of a Sterling engine. **03**
(b) Explain Morse's test method to find indicated power of the engine. **04**
(c) Compare different types of nozzles used in CI engines. **07**
