

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-1/2 EXAMINATION – WINTER 2021****Subject Code:3110006****Date:30/03/2022****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) Define zeroth law of thermodynamics, and First law of thermodynamics. **03**
- (b) With usual notations prove that  $C_p - C_v = R$ . **04**
- (c) Write a difference between SI engine and CI engine. **07**

- Q-2**
- (a) Describe the process of formation steam on T-H diagram. **03**
- (b) Write a short note on “Global Warming and solar energy” **04**
- (c) Ford car having a four cylinder, four stroke petrol engine has 100 mm bore and stroke is 1.25 times the bore. It consumes 4 kg of fuel per hour having calorific value of 41,000 kJ/kg. The engine speed is 800 rpm. Calculate indicated thermal efficiency if mean effective pressure is 0.75 MPa. **07**

**OR**

- (c) A 4-cylinder, two-stroke cycle petrol engine develops 30 kW at 2500 rpm. The mean effective pressure on each piston is 8 bar and mechanical efficiency is 80%. Calculate the diameter and stroke of each cylinder if stroke to bore ratio is 1.5. Also the fuel consumption of engine, if brake thermal efficiency is 28% and calorific value is 43900 kJ/kg. **07**

- Q-3**
- (a) How do you classify steam boilers? **03**
- (b) Draw labeled diagram of Babcock and wilcox boiler. **04**
- (c) An air standard Otto cycle has compression ratio of 6. The temperature at the start of compression is 25°C and pressure is 1 bar. If the maximum temperature of the cycle is 1150°C. Calculate (a) the heat supplied and heat rejected per kg of air (b) network done per kg of air and (c) thermal efficiency of cycle. Assume  $\gamma=1.4$ ,  $C_v= 0.778$  kJ/kg K for air. **07**

**OR**

- Q-3**
- (a) List out application of compressed air. **03**
- (b) Explain single acting reciprocating pump. **04**
- (c) One kg of a gas at 1 bar pressure and 17°C is compressed isothermally to a pressure of 25 bar in a cylinder. The characteristic gas constant is 260 J/kg K. calculate (a) the final temperature (b) work done and (c) change in enthalpy. **07**

- Q-4**
- (a) What is priming? Why priming is required in centrifugal pump but not in reciprocating pump. **03**
- (b) Define (i) Dryness fraction (ii) wetness fraction. **04**
- (c) Explain vapour compression refrigeration cycle used in domestic refrigerator. **07**

**OR**

- Q-4**
- (a) Write function of clutch, Break and Coupling. **03**
- (b) Compare belt drive, chain drive and gear drive. **04**

- (c) Define following mechanical properties: (1) Elasticity (2) Malleability (3) Ductility (4) Stiffness (5) Hardness (6) Toughness (7) Resilience. **07**
- Q-5** (a) Explain open system, closed system and isolated system. **03**  
(b) Define (i) one ton of refrigeration (ii) COP. **04**  
(c) Explain construction and working of centrifugal compressor with neat sketch. **07**
- OR**
- Q-5** (a) Define ferrous and Nonferrous material with example. **03**  
(b) Explain types of Belt Drives. **04**  
(c) Write a short on a single plate (disc) friction clutch. **07**

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