

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– I & II (OLD) EXAMINATION – WINTER 2019****Subject Code: 110006****Date: 03/01/2020****Subject Name: Elements Of Mechanical Engineering****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Steam Table is permitted

- Q.1** (a) What do you mean by non-conventional energy sources? How does it differ from conventional sources? **03**
- (b) Define : (i) Sensible heat (ii) Enthalpy of evaporation **04**
(iii) Heat of superheat (iv) Dryness Fraction.
- (c) 2 kg of gas is compressed from 1 bar and 30 °C according to the law $PV^{1.3} = C$. The pressure after compression is 6 bar. Calculate (1) Characteristic Gas Constant (2) Temperature at the end of compression (3) Work done (4) Heat supplied (5) Change in internal Energy. Take molecular mass of gas = 30, $C_p = 1.75$ kJ/kg K. **07**
- Q.2** (a) Explain the steam formation at constant pressure. **03**
- (b) For adiabatic process derive $PV^\gamma = \text{constant}$. **04**
- (c) Determine the quality of steam for the following cases: **07**
(1) $P = 10$ bar, $v = 0.180$ m³/kg
(2) $P = 10$ bar, $t = 200$ °C
(3) $P = 25$ bar, $h = 2750$ kJ/kg
- Q.3** (a) Give comparison of belt drive, Chain drive and gear drive. **03**
- (b) Differentiate between petrol engine and diesel engine. **04**
- (c) A six cylinder four stroke IC engine is to develop 89.5 KW indicated power at 800 rpm. The stroke to bore ratio is 1.25:1. Assuming mechanical efficiency of 80% and brake mean effective pressure of 5 bar, determine the diameter and stroke of the engine. **07**
- Q.4** (a) Derive equation for air standard efficiency of Otto cycle. **07**
- (b) Determine the compression ratio, The cycle efficiency, and the ratio of maximum to minimum pressure in an air standard Otto cycle from following data: **07**
Minimum temperature 25 °C, Maximum temperature 1500 °C
Take $C_v = 0.718$ kJ/kg K and $\gamma = 1.4$
- Q.5** (a) Classify centrifugal pumps. With neat sketch explain the function of each part of centrifugal pump. **07**
- (b) With neat sketch describe the construction and working of Babcock and Wilcox boiler. **07**
- Q.6** (a) What is refrigeration? Explain the working of vapour compression refrigeration cycle. Name basic components of VCRC. **07**
- (b) What are the applications of compressor? Derive an expression of work done for single stage single acting reciprocating air compressor without clearance. **07**
- Q.7** (a) What are belt drives? List various belt drives and explain cross belt drive. **07**
- (b) What is the difference between ferrous and nonferrous materials? List out various ferrous and nonferrous materials with their application. **07**