

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEM- I / II Winter Examination-Dec.-2011

Subject code: 110006

Date: 30/12/2011

Subject Name: Elements of Mechanical Engineering

Time: 10.30 am -1.00 pm

Total marks: 70

Instructions:

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of Steam Tables and Mollier's Chart is permissible

- Q-1 (a) What is flow and non-flow process? 3
 (b) Define : (i) Sensible heat (ii) Enthalpy of evaporation 4
 (iii) Heat of superheat (iv) Dryness Fraction.
 (c) Calculate the enthalpy per kg of steam at 10 bar pressure and a temperature of 300 °C. 7
 Find also the change in enthalpy if this steam is expanded to 1.4 bar and dryness fraction of 0.8. Take specific heat of superheat steam equal to 2.29 kJ/kgK.
- Q-2 (a) What is adiabatic process? Prove with usual notations the law of governing adiabatic 7
 process process as $PV^\gamma = \text{Constant}$.
 (b) 0.67 kg of gas at 14 bar and 290 °C is expanded to four times the original volum according 7
 to the law $PV^{1.3} = \text{Constant}$.
 Calculate : (1) The original and final volume of the gas.
 (2) The final temperature of the gas .
 (3) The final pressure of the gas. Take $R = 287 \text{ J/kgK}$.
- Q-3 (a) Differentiate between petrol engine and diesel engine. 3
 (b) Derive equation for air standard efficiency of otto cycle. 4
 (c) In an ideal constant volume cycle the pressure and temperature at the beginning of the 7
 compression are 97 kPa and 50 °C respectively. The volume ratio is 5. The heat supplied during the cycle is 930 kJ/kg of working fluid.
 Calculate : (1) The maximum temperature attained in the cycle.
 (2) The thermal efficiency of the cycle.
 (3) Work done during the cycle/kg of working fluid.
- Q-4 (a) State the function of the following : 3
 (1) Pressure gauge
 (2) Fusible plug
 (3) superheater
 (b) With neat sketch describe the working of two stroke cycle petrol engine. 4
 (c) With neat sketch describe the construction and working of Cochran boiler. 7
- Q-5 (a) Give classification of governor. Explain working of any one with neat sketch. 3
 (b) Classify the centrifugal pump and explain with neat sketch the vertex type centrifugal 4
 Pump.
 (c) Classify the air compressor . Differentiate between reciprocating compressor and 7
 rotary compressor.
- Q-6 (a) What is refrigerant? State the most widely used refrigerant. 3
 (b) With neat sketch explain vapour compression refrigeration cycle. 4
 (c) Explain with neat sketch split air conditioner. State its advantages. 7
- Q-7 (a) What is zeroth law of thermodynamics. 3
 (b) With simple sketch explain working of disc clutch. 4
 (c) Write short note on: Type of belt drive. 7
