

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– 1st / 2nd (OLD SYLLABUS) EXAMINATION – SUMMER 2015

Subject Code:110006**Date: 04/06/2015****Subject Name: Element of Mechanical Engineering.****Time: 10.30am-01.00pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) What are the various forms of energy? List the non convectonal sources of energy. **03**
- (b) With usual notation prove $C_p - C_v = R$. **04**
- (c) A cylinder contains 0.6 m^3 of gas at a pressure of 1 bar and 90° C the gas is compressed to volume of 0.18 m^3 according to law $PV^n = C$. The final pressure is 5 bar. Assuming $R = 0.287 \text{ KJ/Kg K}$ and $\gamma = 1.4$
 Calculate : (i) The mass of gas (ii) The Value of Index 'n' for compression.
 (iii) The change in internal energy of gas. **07**
- Q.2** (a) State and explain zeroth Law of Thermodynamics. **03**
- (b) Define : (i) Sensible heat (ii) Latent heat (iii) Dryness Fraction
 (iv) Enthalpy of evaporation **04**
- (c) Combined separating & throttling calorimeter is used to find out dryness fraction of steam. following reading were taken:
 Main pressure = 12 bar ab.
 Mass of water collected in separating calorimeter = 2 kg.
 Mass of steam condensed in throttling calorimeter = 20 Kg
 Temperature of steam after throttling calorimeter = 110° C
 Pressure of steam after Throttling = 1 bar ab.
 Assume C_p of steam = 2.1 kJ/Kg K .
 Calculate dryness fraction. **07**
- Q.3** (a) Derive equation for thermal efficiency of Rankine cycle. **03**
- (b) Differentiate between Petrol engine & diesel Engine. **04**
- (c) In ideal constant volume cycle the pressure & temperature at the beginning of compression are 97 KPa & 50° C respectively. The volume ratio is 8. The heat is supplied during the cycle is 930 kJ/kg of working fluid.
 Calculate : (i) The maximum temperature attained in the cycle.
 (ii) The thermal efficiency of cycle.
 (iii) Work done during the cycle /kg of working fluid. **07**
- Q.4** (a) State the function of following **03**
 (i) Fusible plug (ii) Safety valve (iii) Economizer
- (b) Explain working of four stroke petrol engine with neat sketch. **04**
- (c) What is boiler ? Discuss Construction & working of Cochran boiler with neat sketch. **07**
- Q.5** (a) What is priming? Why it is required in centrifugal pump? **03**
- (b) Explain with neat sketch working of single acting piston pump. **04**
- (c) Classify the Air compressor. Differentiate between reciprocating compressor & rotary compressor. **07**
- Q.6** (a) Differentiate between the functions of governor & flywheel. **03**

- (b) Define Air conditioning .State the basic component of air conditioning systems. **04**
- (c) What is refrigeration ? Explain the working of vapour compression refrigeration cycle. Name basic components of VCRC. **07**
- Q.7** (a) Enlist physical properties of engineering materials. **03**
- (b) List various liquid fuels. State their merits over solid fuels. **04**
- (c) What is brake ? How it differ from clutch? What are various type of clutches? **07**
Name type of clutch is used in scooter and car.
