

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER– 1<sup>st</sup> / 2<sup>nd</sup> (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 convectional sources of energy. **03**
- (b) With usual notation prove  $C_p - C_v = R$ . **04**
- (c) A cylinder contains  $0.6 \text{ m}^3$  of gas at a pressure of 1 bar and  $90^\circ \text{C}$  the gas is compressed to volume of  $0.18 \text{ m}^3$  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: **07**  
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 =  $110^\circ \text{C}$   
Pressure of steam after Throttling = 1 bar ab.  
Assume  $C_p$  of steam =  $2.1 \text{ kJ/Kg K}$ .  
Calculate dryness fraction.
- 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 &  $50^\circ \text{C}$  respectively. The volume ratio is 8. The heat is supplied during the cycle is  $930 \text{ kJ/kg}$  of working fluid. **07**  
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.
- 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.

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