

GUJARAT TECHNOLOGICAL UNIVERSITY
A. D. PATEL INSTITUTE OF TECHNOLOGY, New Vallabh Vidyanagar.
Second Semester : 2008 – 2009, Mid Semester Examination.
110006 : Elements of Mechanical Engineering

Date :- 25/03/2009. Maximum Marks :- 20 Time :-08:00 to 09:00 am

- Note :-
- (1) Answers should be brief and to the point.
 - (2) Draw sketches whenever necessary.
 - (3) Shabbily drawn diagrams and sketches will not be awarded any credit.
 - (4) Assume suitable data, if necessary and indicate the same.
 - (5) Use of Scientific Calculator and Steam Table are permitted.

- Q.1 (a) State Boyle's Law. (1)
- (b) Derive an expression for work done in Isothermal Process. (2)
- (c) One kg. of air at a pressure of 1 bar and 29°C temperature is compressed to a pressure of 10 bar isothermally. Calculate work done and heat transfer. Take $C_p = 1.005 \text{ kJ / kgK}$, $C_v = 0.718 \text{ kJ / kg K}$. (2)

- Q.2 (a) Explain higher and lower calorific value of fuel. (2)
- (b) Define specific heat and explain why specific heat of gas at constant pressure is always greater than specific heat at constant volume. (3)

OR

- Q.2 (a) Give comparison between LPG and CNG. (2)
- (b) Explain Enthalpy and Internal Energy. (3)

- Q.3 (a) Define (i) Dryness fraction and (ii) Degree of superheat (2)
- (b) Determine the specific volume and specific enthalpy of steam under following conditions. (3)
- (i) 20 bar pressure and 0.9 dry
 - (ii) 300 kN/m² pressure and 200 °C

OR

- Q.3 (a) State the limitations of Carnot Cycle. (2)
- (b) A scientist claims that his new engine will develop 0.4 KW for a heat addition of 31 KJ/min. The temperature of heat source is 1990 K and that of sink is 850 K. Is his claim possible? (3)

- Q.4 (a) Differentiate between boiler mountings and boiler accessories. (2)
- (b) A six cylinder four stroke I. C. engine has bore of 163 mm and stroke of 203 mm. The indicated mean effective pressure is 7 bar. It produces 98 kW brake power at 800 rpm. Find mechanical efficiency of the engine. (3)

OR

- Q.4 (a) Explain working of 4 stroke diesel engine with sketches. (2)
- (b) A boiler generates 2500 kg of steam at a pressure of 11 bar and at 200°C temperature per hour. The coal supplied to the boiler at a rate of 300 kg/hr. The feed water temperature is 33°C and calorific value of coal is 31 MJ/kg. Assume specific heat of steam 2.1 kJ/kgK. Calculate (i) Efficiency of boiler and (ii) Equivalent evaporation in kg of steam per kg of coal burnt. (3)

BEST OF LUCK