

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – III • EXAMINATION – WINTER • 2013****Subject code: 732101****Date: 27-11-2014****Subject Name: Advanced Internal Combustion Engine****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

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

Q.1 (a) Develop an expression in terms of the absolute temperature and pressure for change in entropy of m Kg of gas between conditions p_1, T_1 , and condition p_2, T_2 if the specific heat of gas at constant volume is given by $(b - k T)$, while that at constant pressure is given by $(a + k T)$, where a, b and k are constants. **07**

(b) An oil engine takes in air at 1.01 bar, 20°C and the maximum cycle pressure is 69 bar. The compression ratio is 18:1. Calculate the air standard efficiency and mean effective pressure based on dual combustion cycle. Assume that heat added at constant volume is equal to the heat added at constant pressure. Assume $C_p = 1.005 \text{ K J / Kg K}$ $C_v = 0.718 \text{ K J / Kg K}$ **07**

Q.2 (a) Determine the diameter of fuel orifice for a four stroke engine developing 15 k W per cylinder at 2000 rpm using 0.272 kg/ K W hr fuel of 32 API. The duration of injection is 30° of crank travel. The fuel injection pressure is 120 bar and combustion pressure is 30 bar. Assume $C_v = 0.9$ **07**

(b) A four stroke diesel engine has a compression ratio of 14 and works in ambient condition of 1.013 bar and 27 °C. A supercharger is added to the engine which raises the inlet pressure to 1.3 bar and inlet temperature to 60 °C other conditions remaining same the same. What will be the percentage change in charging efficiency and indicated output of the engine. **07**

OR

(b) Write brief note on: Optical methods for flame velocity measurement **07**

Q.3 (a) Discuss the effects of following factors on volumetric efficiency of a four stroke I. C. engine **07**

- Inlet Mach number
- Valve timing
- Inlet and exhaust system design

(b) Explain effects of supercharging on following parameters: **07**

- Power output
- Mechanical efficiency
- Fuel consumption

OR

Q.3 (a) List advantages and disadvantages of constant pressure turbo charging. **07**

(b) Discuss effect of following factors on energy requirement of an ignition system: Electrode material, stray inductance, electrode configuration. **07**

Q.4 (a) Define following terms related to surface ignition: pre-ignition, post ñ ignition, Run ñon, Runaway, wild ping, rumble. **07**

- (b) What do you mean by surface to volume ratio in an engine? How does it affect heat loss? **07**

OR

- Q.4** (a) Discuss suitability of bio gas as an alternate fuel in I. C. Engines. **07**
(b) List advantages and disadvantages of CNG as alternative fuel in I.C. engines. **07**

- Q.5** (a) Explain developments taking place with regard to hydrogen vehicles. **07**
(b) Explain the effect of exhaust emission with variation of air fuel ratio for a petrol engine and variation in vehicle emission with route speed. **07**

OR

- Q.5** (a) Explain various engine modification approaches for improving exhaust emission. **07**
(b) Write brief note on Catalytic converters. **07**
