## M.Tech-Heat Power Engineering Sem II MT-1019.2 - Elective- II : Design of I.C. Engine Components and Subsystems

P. Pages : 2 Time : Three Hours Notes : 1. All questions carry equal marks. GUG/W/16/3963 Max. Marks : 70

- Due credit will be given to neatness and adequate dimensions. 2. 3. Assume suitable data wherever necessary. Illustrate your answers wherever necessary with the help of neat sketches. 4. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart Drawing 5. instruments, thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted. 6. Answer any five questions. Sketch Otto cycle & Diesel cycle on P-V & T-S diagram & derive the equation for Air Std. 7 a) Efficiency for Otto cycle. How does the equivalent ratio affect the thermal efficiency of a constant volume fuel air 7 b) cycle with varying compression ratio? Explain with suitable graph. Calculate the diameter of the fuel orifice of a four stroke engine, which develops 20 kw per a) 8 cylinder at 2000 rpm. The specific fuel consumption is 0.26 kg/kw.hr of fuel wit 30° API the fuel is injected at a pressure of 180 bar over a crank travel of 25°. The pressure in the combustion chamber is 38 bar coefficient of velocity. is 0.85 & sp. gravity is given by  $\rightarrow$ 141.5  $S.G. = \frac{1}{131.5 + °API}$ b) What are the various fuel injection system in diesel engine? Explain any one with neat 6 sketch. What are the various types of combustion chambers used in S.I. engines? Explain then 6 a) briefly.
- b) What are the different types of cooling systems? Explain forced circulation cooling system. 8
- **4.** a) What do you mean by rating of fuel? Explain the method of rating S.I. engine fuels.
  - b) What is the necessity of alternative fuels? discuss in brief the various alternative fuels.
- a) A four cylinder, four stroke diesel engine develops a power of 180 kw at 1500 rpm. The bsfc is 0.2 kg|kw.hr At the beginning of injection, pressure is 30 bar & the maximum cylinder pressure is 50 bar. The injection is expected to be at 200 bar & maximum pressure at the injector is set to be about 500 bar.

Assuming the following. Cd for Injector = 0.7 S.G. of full = 0.875 Atmospheric pressure = 1 Bar Effective pr. difference = Avg. pr. difference over the injection period. determine the total orifice area required per injector if the injection takes place over 15° crank angles.

1.

2.

3.

7

7

- b) Explain the construction & working of Battery Ignition system with the help of neat sketch. 7 6. Explain the effect of supercharging on the following parameters  $\rightarrow$ 8 a) 1) Mechanical efficiency. 2) Volumetric efficiency. 3) Specific fuel consumption. 4) Scavenging. Explain various stages of combustion in C.I. engine. b) 6 7. Explain in brief knocking in SI engine. 6 a) b) Discuss the formation of NO<sub>x</sub> in the exhaust of I.C. engine. what are the important variables 8 that effect NO<sub>x</sub> emissions. 8. Write short notes solve any three. i) Splash lubrication system. 14 ii) Thermosyphon cooling. Three way catalytic converter. iii) Factors considered for design of full Injector. iv)
  - v) Particulate emission of I.C. engine.

\*\*\*\*\*\*