Third Semester M.Tech. Degree Examination, Dec.2013/Jan.2014
Engine Flow & Combustion

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions.*
2. *Use of thermodynamic charts, tables permitted.*

1. a. Define volumetric efficiency of an IC engine and mention the factors affecting it. **(06 Marks)**
   b. Write notes on:
      (i) Residual gas fraction   (ii) Turbocharging. **(08 Marks)**
   c. Explain Scavenging with reference to a two stroke engine cycle. **(06 Marks)**

2. a. Explain clearly how induction swirl is created in CI engines. **(08 Marks)**
   b. Explain briefly the pre-chamber engine flow. **(06 Marks)**
   c. Briefly explain the crevice flows and blow by. **(06 Marks)**

3. a. Describe the essential features of the combustion process in a SI engine. **(08 Marks)**
   b. Explain how the following factors affect the flame propagation in a SI engine:
      (i) Fuel air ratio   (ii) Turbulence   (iii) Engine speed **(06 Marks)**
   c. Explain the phenomenon of knocking in a SI engine. What are the effects of knocking on an engine? **(06 Marks)**

4. a. Explain direct and indirect injection systems in diesel engines. **(08 Marks)**
   b. What is delay period? What are the factors that affect the delay period? **(06 Marks)**
   c. Briefly explain mixing controlled combustion in CI engines. **(06 Marks)**

5. a. Explain the NO_x formation in compression ignition engine. **(08 Marks)**
   b. Explain flame quenching at the cylinder walls. **(06 Marks)**
   c. Write short notes on:
      (i) Particulate traps   (ii) Catalytic converters. **(06 Marks)**

6. a. Write a brief note on engine heat transfer and its effect on performance of engine. **(10 Marks)**
   b. Explain the temperature distribution in various engine components. **(10 Marks)**

7. a. What is meant by supercharging? What is its effect on engine performance? **(08 Marks)**
   b. Discuss supercharged and turbocharged SI engine. **(08 Marks)**
   c. Explain the principle of pressure wave super chargers. **(04 Marks)**

8. a. Explain the different methods to find the friction power of an engine. **(08 Marks)**
   b. A four stroke gas engine has a cylinder diameter of 250 mm and stroke 450 mm. The effective diameter of the brake is 1.6 m. The observations made in a test of the engine are as follows: Duration of test = 40 minutes ;   Total number of revolutions = 8080

            Total number of explosions = 3230;   Net load on the brake = 90 kg

            Mean effective pressure = 5.8 bar ;   Volume of gas used = 7.5 m³

            Pressure of gas indicated in meter = 136 mm of water (gauge)

            Atmospheric temperature = 17°C ;   Calorific value of gas = 19 MJ/m³ at NTP

            Rise in temperature of cooling water = 45°C;   Cooling water supplied = 180 kg

       Find : (i) Mechanical efficiency   (ii) Indicated thermal efficiency
              (iii) Brake thermal efficiency.

       Also draw heat balance sheet on per minute basis. Assume atmospheric pressure as 760 mm of Hg. **(12 Marks)**

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