Code: R7220303

R07

B.Tech II Year II Semester (R07) Supplementary Examinations, April/May 2013

THERMAL ENGINEERING-I

(Mechanical Engineering)

Time: 3 hours Max. Marks: 80

Answer any FIVE questions
All questions carry equal marks

*****

1. (a) Define volumetric efficiency and discuss the effect of various factors affecting the volumetric efficiency.
   (b) Why do designer go for multi cylinder engine for heavy loads and name some multi cylinder types?

2. (a) Describe the phenomenon of pre-ignition in S.I. engines and discuss its effect on the performance.
   (b) What are the various types of combustion chambers used in S.I. engines? Explain them briefly.

3. (a) Explain with figure various types of combustion chambers used in C.I. engine.
   (b) Bring out clearly the process of combustion in C.I. engine. Also explain various stages of combustion.

4. (a) Describe the phenomenon of pre-ignition in S.I. engines and discuss its effect on the performance.
   (b) Explain with a neat sketch the battery ignition system.

5. The following data refer to an oil engine working on Otto 4-stroke cycle.

Brake power	=	14.7 KW,
Suction press	=	0.9 bar,
Mechanical efficiency	=	80%,
Index of compression curve	=	1.35,
Index of expansion curve	=	1.3,
Maximum explosion pressure	=	24 bar,
Engine speed	=	1000 rpm.
Ratio of stroke : bore	=	1.5

   Find the diameter of the piston.

6. (a) Explain the effect of inter cooling in a multi stage reciprocating compressor.
   (b) Determine the size of the cylinder for a double acting air compressor of 40 KW indicated power, in which air is drawn at 1 bar and 15 ℃ and compressed according to the law $PV^{1.2}$ = constant to 6 bar the compressor runs at 100 rpm with average piston speed of 152.5 m/min. Neglect clearance.

7. (a) Compare centrifugal and axial flow compressors.
   (b) A root blower compresses 0.06 m^3 of air from 1.0 bar to 1.45 bar per revolution. Calculate compressor efficiency.

8. (a) What do you mean by surging & choking?
   (b) An axial flow compressor with an overall isentropic efficiency of 85% draws air at 20 ℃ and compresses it in the pressure ratio of 4:1. The mean blade speed and flow velocity are constant throughout the compressor. Assuming 50% reaction blading and taking blade velocity as 180 m/s and work input factor as 0.82 calculate:
   (i) flow velocity and (ii) the number of stages. Take $\alpha = 12°, \beta = 42°, C_p = 1.005$ KJ/kg K.

*****