**R07** 

# II B.Tech II Semester Examinations, APRIL 2011 THERMAL ENGINEERING - I

Common to Mechanical Engineering, Automobile Engineering

Time: 3 hours

Code No: 07A4EC05

### Max Marks: 80

### Answer any FIVE Questions All Questions carry equal marks \*\*\*\*\*

- 1. (a) Draw the velocity triangles for the centrifugal compressor and derive the equation for the estimation of power required to compress the air.
  - (b) What are the function of lobes in Roots blower? Explain the working. [8+8]
- 2. (a) Name the various measurements which are to be taken in a test of an I.C. engine?
  - (b) An engine is used on a job requiring 110 kW B.P., the mechanical efficiency of the engine is 80 % and the engine used 50 kg fuel per hour under the conditions of operation. A design improvement is made which reduces the engine friction by 5 kW. Assuming the indicated thermal efficiency remains the same, how many kg of fuel per hour will be saved. [6+10]
- 3. Explain swirl chamber, pre-combustion chamber, and air-cell combustion chamber in CI Engines. [16]
- 4. (a) Clearly explain the various wet sump lubrication systems?
  - (b) Compare wet sump and dry sump lubrication systems? [10+6]
- 5. Explain different methods to achieve smooth engine operation in SI engines? [16]
- 6. (a) Derive the equation for the work required to compress the air to the desired pressure in axial compressor.
  - (b) An axial flow compressor with compression ratio of 5, draws air at 20<sup>o</sup>C and delivers it at 50<sup>o</sup>C. Assuming 50% degree of reaction, find the velocity of flow if the blade velocity is 100 m/s. Also find the number of stages if work factor  $= 0.85, \alpha = 10^{\circ}, \beta = 40^{\circ}$  and  $C_p = 1.005 \text{ kJ/kg K}.$  [8+8]
- 7. (a) Derive an expression for the shaft work of reciprocating air compressor assuming zero clearance volume.
  - (b) Determine the minimum amount of work required to compress the unit of mass of air from 1 bar 288 K to 40 bar, if the law of compression is  $p^{V1.25}$  = Const in a two stage compressor with perfect inter cooling by neglecting the clearance. [6+10]
- 8. (a) What are different factors affecting knock in SI engine?
  - (b) What are knocking limited parameters in SI engine? [8+8]

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