Code: 9A03402

R09

B.Tech II Year II Semester (R09) Supplementary Examinations December/January 2014/2015

THERMAL ENGINEERING - I

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) What is the use of air-standard cycle? List some air standard cycles.
(b) Discuss the effect of exhaust valve opening time on blow down.

2 (a) What is IC engine? Classify I.C engines.
(b) Compare external combustion and internal combustion engine.

3 (a) Define homogeneous mixture.
(b) Explain different stages of combustion in SI engine.

4 (a) What are the primary considerations in designing a combustion chamber for C.I engine?
(b) State the factors on which delay period in C.I engine depends.

5 (a) Draw the line diagram of a layout of fuel injection system of diesel engine showing all the components.
(b) A petrol engine uses 0.27 kg of fuel per B.P hour. Calorific value of fuel is 44 MJ/kg, mechanical efficiency is 80% and compression ratio is 5.6. Determine brake thermal efficiency, indicated thermal efficiency, ideal air standard efficiency and relative efficiency of the engine. Take γ for air as 1.4.

6 (a) Explain the working of blower with the help of neat sketch.
(b) Derive an expression for minimum work required for two stage reciprocating air compressor with perfect intercooling.

7 (a) Define slip factor and pressure coefficient and write expressions.
(b) Air at temperature of 290 K flows in a centrifugal compressor running at 20000 rpm. The slip factor is 0.80, isentropic total head efficiency is 0.75, and outer diameter of blade tip is 600 rpm. Determine the temperature rise of air passing through the compressor and static pressure ratio. Assume that the velocities of air at inlet and exit of the compressor are same.

8 (a) Derive expression for polytropic efficiency in terms of entry and delivery pressures, temperature and ratio of specific heats.
(b) An axial flow compressor is to have constant axial velocity of 250 m/s and 50% degree of reaction. The mean diameter of blade ring is 45 cm and speed is 18000 rpm. The exit angles of the blade are 25^{o}. Calculate blade angle at inlet and work done per kg of air with the help of velocity triangles.

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