Code: 9A03402

R09

B.Tech II Year II Semester (R09) Supplementary Examinations May/June 2017

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) Compare actual and fuel-air cycles of IC engine.
(b) Explain the influence of time loss factor in IC engine.

2 (a) What is I.C engine and briefly explain how they are classified?
(b) Explain with neat sketch, the construction and working of fuel pump.

3 What are the various types of combustion chambers used in SI engines? Explain them briefly.

4 (a) What do you mean by Octane number and Cetane number of fuels?
(b) What is supercharging of IC engine? Write few applications.

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) What are the differences between rotary air compressor and reciprocating air compressor?
(b) A single stage single acting reciprocating compressor delivers 15 m^3 of free air per minute, from 1 bar to 8 bar. The speed of the compressor is 300 rpm. If the clearance is 1/16 th of the swept volume, determine the diameter and stroke of the compressor. Take stroke to diameter ratio as 1.5 and compression index as 1.3.

7 (a) Draw the velocity diagrams for inlet and outlet of the impeller of a centrifugal compressor by assuming the air entry is axial.
(b) Differentiate between Roots blower and Vane compressor of positive displacement type compressors.

8 (a) Explain the mechanical details and working principle of an axial flow compressor.
(b) An axial flow compressor draws air at 1 bar and 20℃. Assuming 50% degree of reaction, find the velocity of flow if the blade velocity is 100 m/s. Take air angle, vane angle at inlet are $10°$ and $40°$ respectively. Estimate the work done per kg of air and power developed if the flow area is 0.2 m^2.

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