Code: 9A 14302

R9

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2012

ENGINEERING THERMODYNAMICS

(Mechatronics)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Explain what do you understand by thermodynamic equilibrium.
(b) To a closed system 150 KJ of work is supplied. If the initial volume is 0.6 M^3 and pressure of system changes as P = 8-4 V, where P is in bar and V is in M^3 determine the final volume and pressure of the system.

2 (a) Prove C_P - C_V = R.
(b) A thermometer is calibrated in such a way that it reads 32^0 N when placed in melting ice and 212^0 N when placed in boiling water. What will it read when the measure temperature is 288^0 K.

3 (a) Derive an expression for availability in a steady flow process.
(b) Find the maximum work per Kg of air that can be obtained from a piston cylinder arrangement if the air expands from an initial state 9 bar 400 K to a final state of 1.5 bar, 300 K. Assume T_0 = 288 K and P_0 = 1 bar.

4 (a) An engine working on Otto cycle has its upper and lower temperature limits T_1 and T_3. If the cycle is designed to do maximum work, show that intermediate temperature $T_2 = T_4 = \sqrt{T_1.T_3}$.
(b) The compression ratio in a diesel cycle is 14 and the cut off occurs at 10% of the stroke. Determine the cut-off ratio and thermal efficiency of the cycle.

5 (a) Explain the working of a Rankine cycle with the help of T-S diagram and derive an expression for its efficiency.
(b) What are the methods to improve the efficiency of a Rankine cycle?

6 State the function of a carburetor in a petrol engine. Explain the working with a neat sketch and state its limitations.

7 Explain the phenomena of knocking in SI engine. What are the different factors which influence the knocking? Describe the methods to suppress it.

8 (a) Describe with neat diagram a closed cycle gas turbine.
(b) State its merits and demerits.

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