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Paper Code & Roll No. to be filled in your Answer Book

Roll No. | | | | | | | | | | | |

Odd Semester Examination-2016

B.Tech. (Semester-VII)

ENGINEERING THERMODYNAMICS

[Time : 2 Hours] [Maximum Marks :50]

Note : Attempt **all** questions. All questions carry **equal** marks. Assume missing data suitably.

1. Attempt **any two** parts : [5×2=10]

   (a) Discuss the physical significance of entropy.

   (b) Explain Brayton-Rankine combined cycle in detail.

   (c) Derive Maxwell equation.

2. Attempt **any two** parts : [5×2=10]

   (a) Explain Joule-Thompson effect. What is inversion curve and inversion temperature?

   (b) Derive 1st , 2nd and 3rd TdS equation.

(c) Explain the Clausius-Clapeyron equation with graph.

3. Attempt **any two** parts: [5×2=10]

(a) A single acting reciprocating air compressor has cylinder diameter and stroke of 200 mm and 300 mm respectively. The compressor sucks at 1 bar and 27°C and delivers at 8 bar while running at 100 rpm. Find (i) Indicated power of the compressor (ii) Mass of air delivered by the compressor per minute; (iii) temperature of the air delivered by the compressor. The compression follows the law $pv^{1.25} = C$. Take R = 287 J/kg-K.

(b) Discuss the equivalence of Kelvin-Plank and Clausius statement of second law of thermodynamics.

(c) Show that there is decrease in available energy when heat is transferred through a finite temperature difference.

4. Attempt **any two** parts: [5×2=10]

(a) For a given compression ratio; the Diesel cycle is less efficient than Otto cycle. Explain with the help of suitable P-V and T-S diagrams.

(b) A certain quantity of air at a pressure of 1 bar and temperature 70°C is compressed reversibly and adiabatically until the pressure is 7 bar in an Otto cycle engine. 460 kJ of heat per kg of air is now added at constant volume. Determine :

(i) compression ratio,

(ii) temperature at the end of compression

(iii) temperature at the end of heat addition.

(Take C_p=1 kJ/kg-K and C_v=0.707 kJ/kg-K

(c) Explain the exergy balance for a closed system and a steady flow open system.

5. Write short notes on **any two:** [5×2=10]

(a) Diesel cycle

(b) Joule Kelvin effect

(c) Helmholtz and Gibbs free energy

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