Code: R7212302

R07

B.Tech II Year I Semester (R07) Supplementary Examinations, May 2013
THERMODYNAMICS FOR BIOTECHNOLOGISTS
(Biotechnology)

Time: 3 hours   Max. Marks: 80

Answer any FIVE questions
All questions carry equal marks

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1   Write short notes on:
   (a)   Temperature scales.
   (b)   Pressure.
   (c)   Work.
   (d)   Energy.

2   Give the two statements of second law of thermodynamics and show that for two given heat reservoirs no engine can have a thermal efficiency higher than that of a Carnot engine.

3   (a)   Give an example of a fundamental relation.
    (b)   What is an equation of state? How many equations of state are there for a single component of simple compressible substance?

4   Write the general material balance equation for the batch reactor and derive the performance equation for plug flow reactor.

5   Write short notes on:
   (a)   Virial equations of state.
   (b)   Generalized compressibility chart.

6   (a)   What is the disadvantage in Rault's law and explain with an example?
    (b)   What is Henry's law and how the disadvantage in Rault's law is overcome by this law?

7   (a)   Using the summability relation, show that $\overline{M_1} = M + x_2 \frac{dM}{dx_1}$ and $\overline{M_2} = M - x_1 \frac{dM}{dx_1}$.
    (b)   Write Gibbs-Duhem equation in terms of activity coefficients and also in terms of fugacity.

8   For a system in which the following reaction occurs.
         $CH_4 + H_2O \rightarrow CO + 3H_2$
      Assume there are present initially 2 mol CH_4, 1 mol H_2O, 1 mol CO and 4 mol H_2. Determine expressions for the mol fractions y_i as functions of reaction co-ordinate.

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