Reactions for Energy (EN 220) – Spring Semester 2024-25

Quiz 1 Total Marks: 12

Please answer all the questions. Time: 55 minutes

Make and state appropriate assumptions, wherever necessary

Note: Sharing of Calculator and JANAF tables are not allowed.

1. A reaction chamber contains a mixture of CO_2, CO and O_2 in equilibrium at a specified pressure and temperature. How would (a) increasing the temperature at constant pressure and (b) increasing the pressure at constant temperature affect the number of moles of CO_2? (c) Now the pressure is doubled. What will happen (increase/decrease/unchanged) to the equilibrium constant. Justify all your answers. **1+1+1 marks**

2. What are the higher and lower heating values of a fuel? How do they differ? How is the heating value of a fuel related to the enthalpy of combustion of that fuel? **1+1+1 marks**

3. Octane enters the combustion chamber (represented as a control volume) steadily at 1 atm and 25°C and it burns with air that enters the combustion chamber at the same state. The equivalence ratio of the air and fuel mixture in the combustion chamber is 0.8 and complete combustion of the fuel takes place. Determine the adiabatic flame temperature assuming no dissociation of the products. Show all the calculation steps along with assumptions (if any) clearly. Without calculation steps, there will be mark penalty. **6 marks**