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**Reactor Engineering**  
**Qualifying Exam Question**  
**Spring 2018**

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*Please answer the following questions:*

1. Describe the second law of thermodynamics and draw a T-S diagram of a LWR steam ranking cycle
2. Derive the maximum fuel temperature from conduction equation for a LWR rod. Clearly state your assumptions when solving the conduction equations.
3. Write down newton's law of cooling. Rank and describe different heat transfer regimes for liquid, two-phase mixture and vapor for water. Identify each regime present in PWRs and BWRs.
4. Write down the geometric buckling of a cylindrical shaped core and derive the 1 group approximation for neutron leakage.
5. Describe the differences between a fast and thermal reactor from reactor physics point-of-view (Fuel utilization, reactivity control, Cross-Sections for U and Pu isotopes)
6. State the current 10CFD50.46c LOCA criterion and describe the critical safety functions that allow a PWR to meet these limits.
7. Derive the von-misses stress criterion in a reactor pressure vessel assuming thin shell theory approximation.