Study Guideline for ChE 310 Final Exam

Your final exam will be closed book and closed notes. You can bring three note cards (standard sizes: no larger than 5" x 8") for the final exam.

1. **Differences between molecular and convective transport for the energy, mass and momentum.**

    a. Define the fluxes of the molecular transports using Phenomenological Laws.
    b. Define the fluxes of the convective transports using the transfer coefficients.
    c. Transports Vs. transfer coefficients.

2. **Differential balances for the energy, mass and momentum transports.**

    a. Differential Control Volumes for different geometries.
    b. Deriving an appropriate Differential Equation by taking a proper limit of the general energy/mass/momentum balances.
    c. Be able to account for the convective term (ex. cooling fine problems)
    d. Choosing proper boundary conditions.
    e. Deriving the energy/mass/momentum fluxes and their profiles by applying proper boundary conditions.

3. **Energy Transports**

    a. Conduction Vs. Convection
    b. Fourier's Law Vs. Newton's Law of Cooling
    c. Thermo conductivity Vs. Heat Transfer Coefficient
    d. Heat Transfer Coefficient: Its definitions and Prediction [I will not ask this for your final in this year]
    e. Natural Convection Vs. Forced Convection
    f. Heat Flux in Terms of Total Driving Force and Total Thermal Resistance (an equivalent simple circuit model) for Different Geometries.
    g. Nusselt # [I will not ask this for your final in this year]

4. **Mass Transports**

    a. Diffusion Vs. Mass Convection
    b. Fick's Law Vs. Mass Convective Equation
    c. The Total Mass Flux Equation: Know each term and its physical significant.
    d. Mass Transfer Coefficients: Its Definition and Prediction [I will not ask this for your final in this year]
    e. Sherwood # [I will not ask this for your final in this year]

5. **Momentum Transports**

    a. Molecular Transport Vs. Convective Transport

b. Momentum Flux Vs. Shear Stress for Newton's Law of Viscosity
c. Continuity Equation: Be able to explain each term.
d. Equation of Motion: Be able to explain each term in Navier-Stokes Equations for Different Geometries
e. Reynolds #: Laminar Vs. Turbulent Flow / Inertial Force Vs. Viscous Force
f. Be able to draw a simple momentum and velocity profiles without doing any calculation.

6. **Predicting Transport Coefficients and Transfer Coefficients [I will not ask this for your final in this year]**

7. **Dimensionless Analysis**

a. Transform dimensional equation into dimensionless equation .
b. Dimensionless Numbers: Know their definition and physical significances.
c. Know how to solve the transport problems using Gurney-Lurie Charts