Final Exam.

10:00-12:00 June 16, 2008-06-11

1. (a) Write down a power balance equation in fusion reactor and explain each term. (b) Derive conditions of breakeven, Lawson criterion and ignition from the power balance equation.
2. (a) Explain why plasma confinement is one of the most critical issues for the success of thermonuclear fusion reactor. (b) By using the expression for fusion power density, describe how to improve fusion power economy in terms of both technology and physics.
3. (a) Estimate plasma diamagnetism from particle orbit theory. (b) Explain how to measure a tokamak energy confinement time in ohmic discharges by using simple magnetic diagnostics.
4. Obtain plasma oscillation frequencies from two-fluid equations by using linear perturbation theory.
5. (a) Write down Grad- Shafranov equation to describe tokamak equilibrium and explain meaning of each term. (b) Explain how to use the G-S equation for equilibrium configurations in actual tokamak experiments.
6. Explain Pfirsch-Schluter current, ware pinch effect and bootstrap current heuristically.
7. Explain neoclassical and anomalous transport phenomena for various collisional frequency regimes in tokamak plasmas.
8. Explain how the tokamak beta limit can be assessed theoretically and empirically.
9. (a) Describe roles of neutral beam injection in tokamak. (b) Do you think these roles can be made in ITER as before?
10. Describe accessibility and resonant absorptions of O and X waves from cold plasma dispersion relation as shown below.

