DIFFERENTIAL EQUATIONS 1 QUESTIONS

You are expected to be able to state the following definitions and theorems (no proofs are required):

1. First order explicit ODE, solution to the first order explicit ODE, IVP, Autonomous ODE, Lipschitz-property and its variants, Picard's integral equation

2. Picard-Lindelöf's Theorem, local version, local and global uniqueness of solutions, maximal solution, Picard-Lindelöf's Theorem, global version

3. Euler's method, ε-approximate solution, equicontinuity of a set of functions, Arzela-Ascoli's Theorem, existence of ε-approximate solutions, convergence of ε-approximate solutions, Cauchy-Peano's Existence Theorem

4. Continuous dependence (local and global version), differentiable dependence

5. Gronwall's Lemma I., domain of maximal solutions to a first-order linear system, structure of solutions (homogeneous and inhomogeneous case), number of solutions, fundamental system, fundamental matrix

6. Variation of parameters (in different cases), Conversion principle (from higher order ODE to a system)

7. Linear phase portraits (saddle, node, spiral), Equilibrium point, stable, attractive, asymptotically stable and unstable equilibrium

8. Stability of (the origin) of a homogeneous linear system, Routh-Hurwitz's criterion, Stability of an equilibrium in the nonlinear case (by linearization)

9. Lyapunov's stability theorem, Lyapunov's unstability theorem, Barbashin-Krasovski's theorem

10. Definition and basic properties of Laplace's Transform