MASTER'S EXAM IN APPLIED MATHEMATICS

THE FOLLOWING ARE TOPICS WHICH ENCOMPASS THE BASIC KNOWLEDGE A MASTER'S STUDENT SHOULD HAVE. THIS INCLUDES ALL DEFINITIONS, IMPORTANT THEOREMS (CERTAINLY NAME BRAND THEOREMS), AND STANDARD EXAMPLES RELATED TO THESE TOPICS.

1. **Calculus of Variations**
    a. **Minimization of a Functional (Energy)**
    b. **Euler-Lagrange Equation in one dimension and higher dimensions**
    c. **Isoperimetric problems cover**
    d. **Hamilton's principle**
    e. **Variational problems**
2. **Partial Differential Equations**
    a. **Bernoulli's Separation of Variables**
    b. **Variational Formulation of the Heat, Wave, and Laplace Equation**
    c. **Kirchhoff's formula**
    d. **Solutions of Differential Equations through Separation of Variables and Fourier Series**
    e. **Maximum Principle**
    f. **Self-Adjoint Differential Equations**
    g. **Huygen's Principle for the wave equation**
    h. **Dirichlet's principle**
    i. **Mean value property for harmonic functions**
3. **Operators**
    a. **Eigenvalues and Eigenfunctions**
    b. **Formulation and use of Green's functions**
    c. **Fredholm Alternative**
4. **Spherical harmonics**
    a. **Bessel functions**
    b. **Legendre functions**