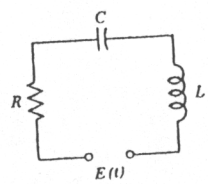
1. **(20 points) First- and Second-Order Differential Equations (10 points each)**
   (a) A tank contains 1000 gal of water in which 200 lb of salt are dissolved. Fifty gallons of brine, each containing (1 + cos *t*) lb of dissolved salt, run into the tank per mimute. The mixture, keep uniform by stirring, runs out at the same rate. Find the amount of salt *y(t)* in the tank at any time *t*.
   (b) Find the steady-state current in *RLC*-circuit when *R=50 ohms, L=30 henrys, C= 0.025 farad, E(t)= 200 Sin 4t volts.* (參考圖一)

2. **(20 points) Laplace Transforms and Fourier Analysis (10 points each)**
   (a) Please state the reason why an engineer needs to learn and understand Laplace and Fourier transformation, Fourier series and Integrals.
   (b) For a full-wave rectification of *Sin wt,* find its Laplace transform and Fourier Series representation.

3. **(20 points) Probability and Mathematical Statistics (10 points each)**
   (a) Please explain "***Normal or Gauss Distribution***" by using descriptive and quantitative statements.
   (b) Compute the probability of obtaining at least two "*six*" in rolling a fair die 4 times.



RLC-circuit

4. **(20 points) Linear Algebra (10 points each)**
   (a) Find the inverse of the matrix [A]
   (b) Find the eigenvalues and eigenvectors of the matrix [B]
   where:

$$[A]=\begin{bmatrix}3 & 1\\ 2 & 4\end{bmatrix} \qquad [B]=\begin{bmatrix}5 & 4\\ 1 & 2\end{bmatrix}$$

圖一

5. **(20 points) Numerical Analysis**
   What is (a) **ill-condition** of a linear system equations? (7%)
   (b) **convergence** of an iteration process? (7%)
   (c) **spline** in function approximation? (6%)