تمهيدي ماجستير / الرياضيات البحته

المقرر: معادلات تكاملية

Fredholm Integro-Differential Equations

This type of equations was termed as Fredholm integro-differential equations, given in the form

$$u^{(n)}(x) = f(x) + \lambda \int_a^b K(x,t)u(t)dt.$$

We remark here that we will focus our concern on the equations that involve separable kernels where the kernel $K(x, t)$ can be expressed as a finite sum of the form

$$K(x,t) = \sum_{k=1}^{n} g_k(x)\, h_k(t).$$

Without loss of generality, we will make our analysis on a one term kernel $K(x,t)$ of the form

$$K(x,t) = g(x)\, h(t),$$

and this can be generalized for other cases.

1- The Direct Computation Method

2- The Adomian Decomposition Method

3- The Modified Decomposition Method

4- The Noise Terms Phenomenon

5- The Variational Iteration Method

6- Converting to Fredholm Integral Equations

Volterra Integro-Differential Equations

This new type of equations was termed as Volterra integro-differential equations, given in the form

$$u^{(n)}(x) = f(x) + \lambda \int_0^x K(x,t)u(t)dt.$$

We will focus our study on equations that involve separable kernels of the form

$$K(x,t) = \sum_{k=1}^{n} g_k(x)\, h_k(t).$$

Without loss of generality, we will consider the cases where the kernel $K(x, t)$ consists of one product of the functions $g(x)$ and $h(t)$ given by

$$K(x,t) = g(x)\, h(t),$$

where other cases can be generalized in the same manner.

1- The Series Solution Method

2-The Adomian Decomposition Method

3-The Variational Iteration Method

4-Converting to Volterra Integral Equation

5-Converting to Initial Value Problems

6-Volterra Integro-Differential Equations of the First Kind