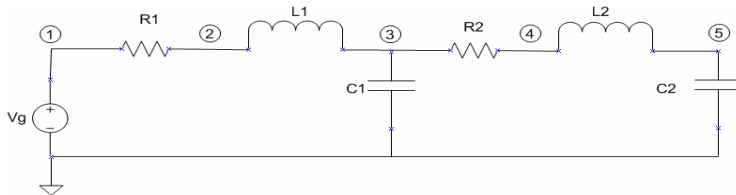


CSE245 Computer Aided Circuit Simulation and Verification

Homework #5. Due 11/30/2004

1. Companion Models

Consider the circuit shown below and use the companion models derived in class to write the system of equations for time domain solution by the backward Euler Formula



2. Adams-Bashforth and Forward Euler Method

For the initial value problem:

$dy/dt = 1 + (t-y)^2$, $2 \leq t \leq 3$, $y(2) = 1$, with $h = 0.2$; actual solution is $y(t) = t + 1/(1-t)$

1) Use the second order Adams-Bashforth formula to approximate the solution of the above problem, and compare the result with the actual solution. Use exact starting values $y(2)=1$ and $y(2.2)=1.3667$.

2) Use the Forward Euler formula to approximate the solution of above problem, also use $y(2)=1$ and $h=0.2$.

t	exact value	Adams-Bashforth result	Error	FE result	Error
2					
2.2					
2.4					
2.6					
2.8					
3.0					

3. Forward Euler and Stability

Consider the following initial value problem:

$dy/dt = -10y$, $y(0) = 1$, the actual solution is $y = e^{-10t}$

- With timestep $h = 0.01$, use the Forward Euler Method to approximate the solution of above problem. Carry out 5 iterations, and compare the result with the actual solution.
- Same as a), but change timestep to $h=0.2$
- How to choose the timestep h to make Forward Euler method stable for this problem?

4. Newton-Raphson Method

Use Newton-Raphson method to find solutions accurate within 10^{-4} (i.e. stop at iteration n if $x_n - x_{n-1} < 10^{-4}$) for the following problems:

- $x^3 + 3x^2 - 1 = 0$, $-3 \leq x \leq -2$
- $x - \cos x = 0$, $0 \leq x \leq \pi/2$