Lab 5

Rohan Rajan, Ryan St.Pierre, Doyong Kim

October 23, 2017

```
> restart
```

Helpful functions

```
> with(inttrans):
> u := t -> Heaviside(t):
> PAR := (Za, Zb) -> simplify((Za*Zb)/(Za+Zb)):
> SCS := X -> sort(collect(simplify(expand(numer(X))/expand(denom(X))), s), s):
> IL := (X, s, t) -> simplify(convert(invlaplace(convert(X, parfrac, s), s, t), expsincos)):
> ILTS := (X, s, t) -> simplify(convert(invlaplace(X, s, t), expsincos)):
```

Define the system of equations

```
> eqn1 := (mAir*s^2 + (b + bAcc)*s + k + kAcc)*Xs - (bAcc*s + kAcc)*Xacc = qEMF
      *curr:
> eqn2 := -(bAcc*s + kAcc)*Xs + (mAcc*s^2 + bAcc*s + kAcc)*Xacc = 0:
> eqn3 := (Lsp*s + Rsp)*curr = Vs - qEMF*s*Xs:
```

Solve using Maple

```
> sol := solve({eqn1, eqn2, eqn3}, [Xs, Xacc, curr]):
> TF := simplify(expand((s*rhs(sol[ ][2]))/Vs)):
```

Display the TF - we do not substitute the values in here. This is done in Matlab

```
> SCS(TF)
```

$$((bAcc\,s + kAcc)\,qEMF\,s) \Big/ (Lsp\,mAcc\,mAir\,s^5 + (((b + bAcc)\,Lsp + Rsp\,mAir)\,mAcc + Lsp\,bAcc\,mAir)\,s^4 + (((k + kAcc)\,Lsp + (b + bAcc)\,Rsp + qEMF^2)\,mAcc + (b\,bAcc + kAcc\,mAir)\,Lsp + Rsp\,bAcc\,mAir)\,s^3 + (Rsp\,(k + kAcc)\,mAcc + (b\,kAcc + bAcc\,k)\,Lsp + (b\,bAcc + kAcc\,mAir)\,Rsp + qEMF^2\,bAcc)\,s^2 + (k\,Lsp\,kAcc + (b\,kAcc + bAcc\,k)\,Rsp + qEMF^2\,kAcc)\,s + Rsp\,k\,kAcc) \tag{1}$$

```
>
```