EE 443L: Lab 6 Maple Handout

```
> restart: with(linalg):
Warning, new definition for norm
Warning, new definition for trace
> K[m]:=0.12; K[b]:=0.12; R[a]:=1.35; L[a]:=0.0012; b:=0.0000843;
  J:=0.0000373;
```

Motor TF:

```
> G[1] := 1/(L[a]*s+R[a]);
```

$$G_1 := \frac{1}{L_a s + R_a}$$

```
> G[2] := 1/(J*s+b);
```

$$G_2 := \frac{1}{J s + b}$$

```
> G[motor] := collect(simplify(G[1]*K[m]*G[2]/ (1 +
  G[1]*K[m]*G[2]*K[b])),s);
```

$$G_{motor} := \frac{K_m}{L_a s^2 J + (L_a b + R_a J) s + K_m K_b + R_a b}$$

Speed TF:

The controller is a simple proportional controller:

```
> G[c] := K[v];
```

$$G_c := K_v$$

```
> G[cl_speed] := collect(simplify(G[c] * G[motor] / ( 1 + G[c] *
  G[motor])),s);
```

$$G_{cl\_speed} := \frac{K_v K_m}{L_a s^2 J + (L_a b + R_a J) s + K_m K_b + K_v K_m + R_a b}$$

Position TF:

The controller is now a PI type controller:

```
> G[c] := K[p] + K[i]/s;
```

$$G_c := K_p + \frac{K_i}{s}$$

Dont forget to include the integrator to get the motor positional TF!!

```
> G[motor] := G[motor] * 1/s;
```

$$G_{motor} := \frac{K_m}{(L_a s^2 J + (L_a b + R_a J) s + K_m K_b + R_a b) s}$$

```
> G[cl_position] := collect(simplify(G[c] * G[motor] / ( 1 + G[c] *
  G[motor])),s);
```

$$G_{cl\_position} := \frac{(K_p s + K_i) K_m}{s^4 L_a J + (L_a b + R_a J) s^3 + (K_m K_b + R_a b) s^2 + K_m K_p s + K_m K_i}$$