chapter9_4 Speed control of DC motors via shunt voltage adjustment

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% Mechatronics: Principles & Applications Toolbox Version 1.0
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%
% Chapter 9: Speed control of DC motors via shunt voltage adjustment
%
% Example 9.4    MATLAB's calculating power is greatly enhanced using the
Symbolic
% Math Toolbox. In this example we demonstrate its power by deducing the
% ratio of final speed to initial speed,ratio of final to initial no-load
% speed, and ratio of final to initial speed-drop
%data
%Problem 1
%data
%Vt=24;
%Ra=2;
%Kphi=3;
%Ia=6;

%input data from keyboard
Kphi=input('Flux-motor constant (volt-sec): Kphi  '); %input from keyboard
Vt=input('Initial Source voltage (volt): Vt  '); %input from keyboard
Ra=input('Armature resistance  (ohm): Ra  '); %input from keyboard
Ia=input('Armature current: (amps): Ia  '); %input from keyboard

%computation commences
'Rated torque'
Td=Kphi*Ia

%computation commences
Adjustment=input('Increase (+)/Reduction (-) in shunt voltage/field (%):
Adjustment  '); %input from keyboard
%computation commences
Red=(1+Adjustment/100)
'Flux in state 1'
Kp1=Kphi
'Speed at state 1'
W1=Vt/Kp1-Ra*Td/(Kp1^2)
'Flux in state 2'
Kp2=Kphi*Red
'Speed at state 2'
W2=Vt/Kp2-Ra*Td/(Kp2^2)
'Ratio of final speed to initial speed: W2/W1'
Ratio=W2/W1
'Ratio of final to initial no-load speed: W02/W01'
```

```
Ratio_no_load=Kp1/Kp2
'Ratio of final to initial speed-drop: dW2/dW1'
Ratio_speed_drop=(Kp1/Kp2)^2

'Finish'
```