Al-Ahliyya Amman University
Faculty of Engineering
Department of Electrical Engineering

Control systems lab
Experiment (5)
. **Motors, tachogenerator and brake characteristics.**
Raneem Mohammad
201720969

Objective:

*Study the steady speed of the motor and its proportional relation to the applied voltage and to the dc tachogenerator signal.

*Studying the braking load and its effect on the motor speed.

*The response of the motor to change of the input is not immediate, but may be expressed as the motor time constant

PROCEDURE:

Part (I) (steady state characteristics, brake load)

1) Connect the system shown if the fig5.2
2) Adjust P3 to give a voltage in the range (-10, +10) to be applied to the power amplifier.
3) By setting sw1 and varying P3 , measure the motor speed and the generated output voltage for different values of applied voltages and fill the table 5.1.

Note: since the reduction to the output shaft is 32:1, 1000 r/min at the motor corresponds with 31 r/min at the output shaft.
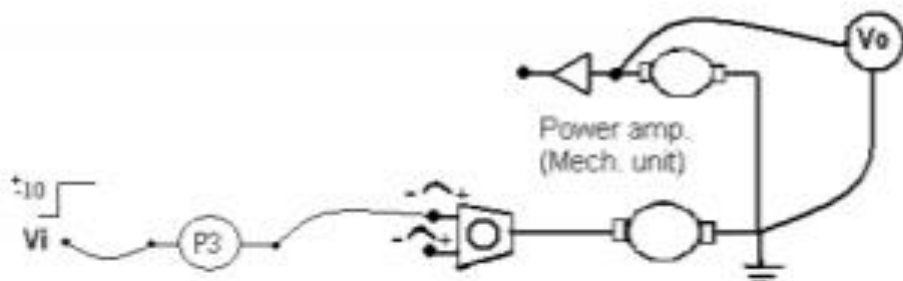

Fig5.2

Table5.1

Vin	Motor Speed	Tacho Voltage
-10	-67.5	-4.6
-8	-53.6	-4.3
-6	-42.5	-3.3
-4	-26.5	-1.99
-2	-12.3	-0.95
0	0	0
2	11.2	0.98
4	28	2.3
6	42	3.34
8	52.1	5.05
10	74.6	6.12

Q5.1 a) What is the relation between the applied voltage and the motor speed?

The relation between the applied voltage and the motor speed is direct proportional
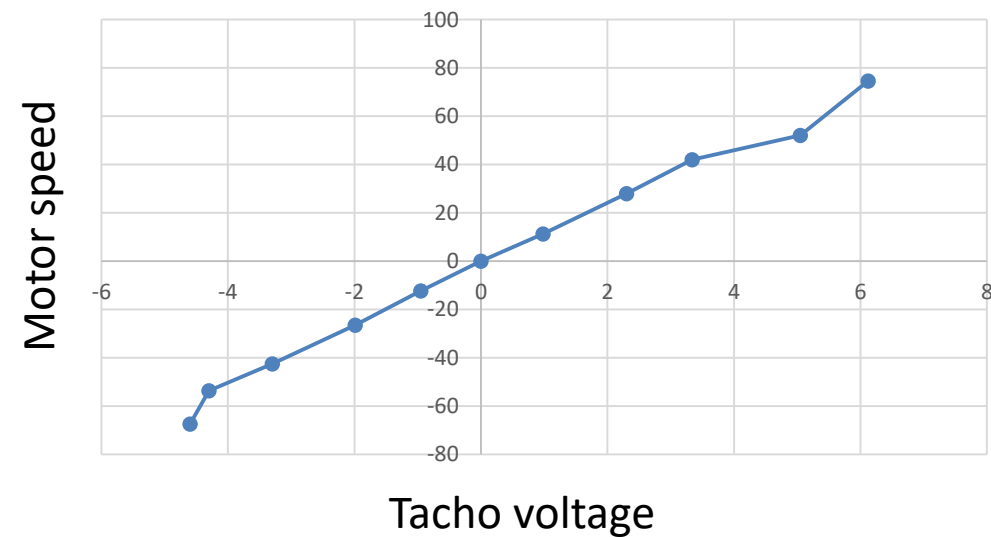
b) Plot the motor speed against applied voltage (**motor characteristic**)

motor speed against applied voltage

Applied voltage / Motor speed
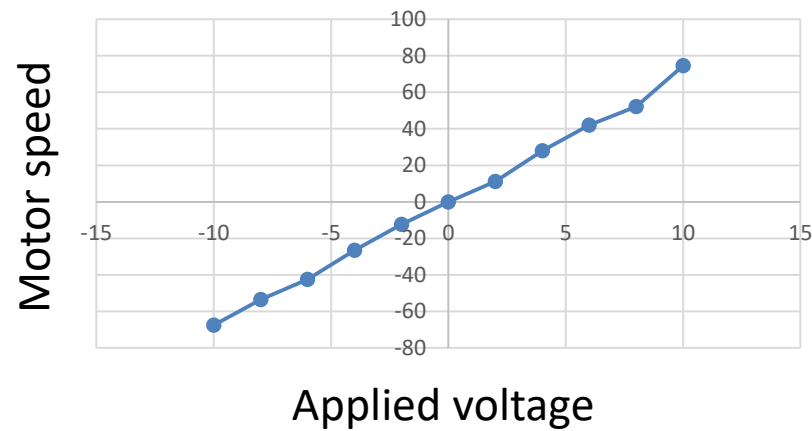
Q5.2) a) Plot the tachogenrator output voltage against motor speed (**tachogenerator characteristics**)

tacho voltage againist motor speed

Tacho voltage / Motor speed

b) Does the tachogenerator voltage related to the applied voltage? Why?

Yes, It is direct proportional relation because when we increase the applied voltage the taco generator voltage will increase

PART (II): (Brake load)

1) Adjust P3 to set the motor speed to 2000r/min (62.5 r/min) at the output with the brake fully upwards.
2) Connect the voltmeter to the mechanical unit to measure the armature current fig5.3.
3) Set the brake to each of its six position in turns and for each setting record the speed and the armature current as shown in table 5.2
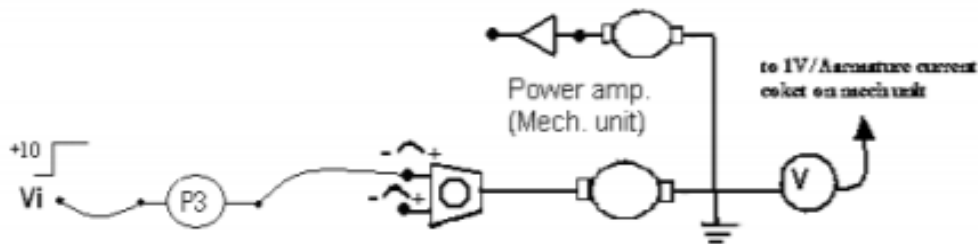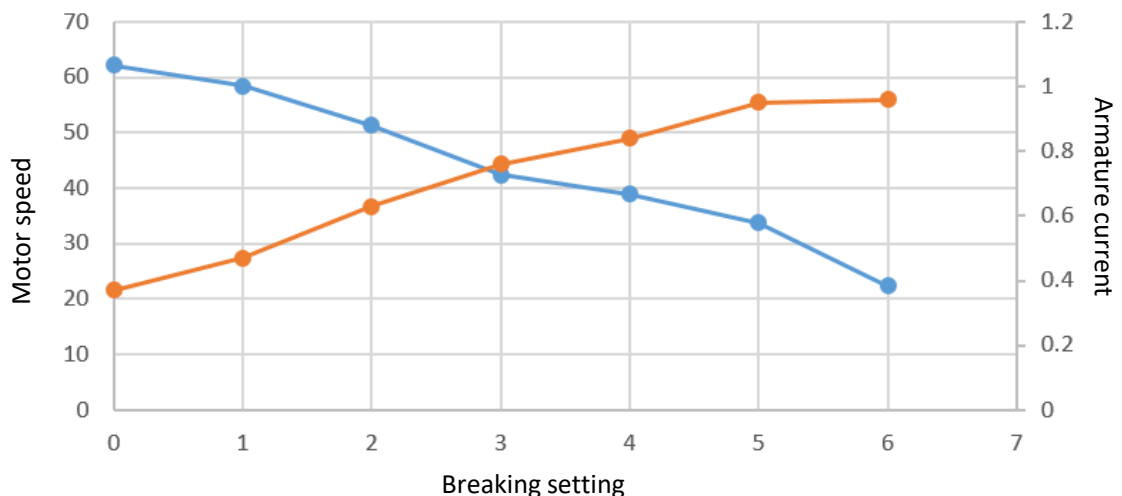

Fig5.3

Table5.2

Brake setting	Motor speed	Armature current (Ia)
0	62.2	0.37
1	58.4	0.47
2	51.3	0.63
3	42.4	0.76
4	38.9	0.84
5	33.8	0.95
6	22.4	0.96

Q5.3) a) plot the motor speed and the armature currents Ia against the brake setting on the same graph.

Breaking setting

b) How does decreasing the load affects the motor speed and the armature current?

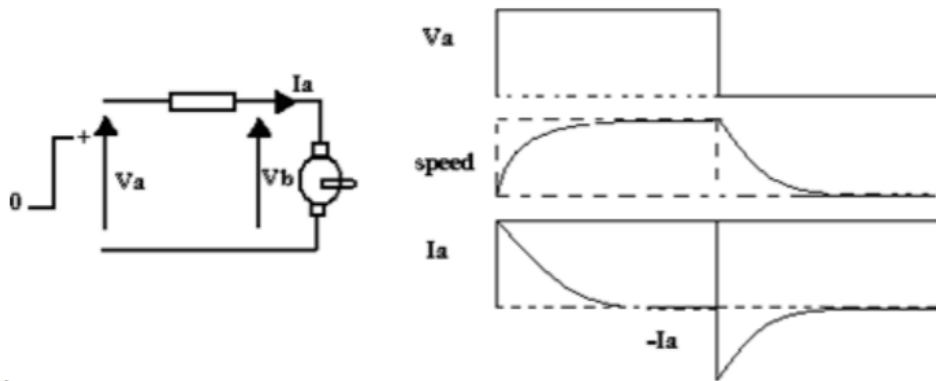Motor speed will increase but the armature current will decrease

Fig 5.4

Procedure:

1) Connect the system as shown in the fig5.5
2) Set p3 to zero.
3) Set the test signal frequency to 0.2 HZ.
4) Set the power amplifier adjustment to run the motor at max speed in one direction.
5) Set the square wave signal, turn up P3 the motor will speed up and slow down the motor.
6) Plot the signal shown in the oscilloscope, which represents the motor speed.
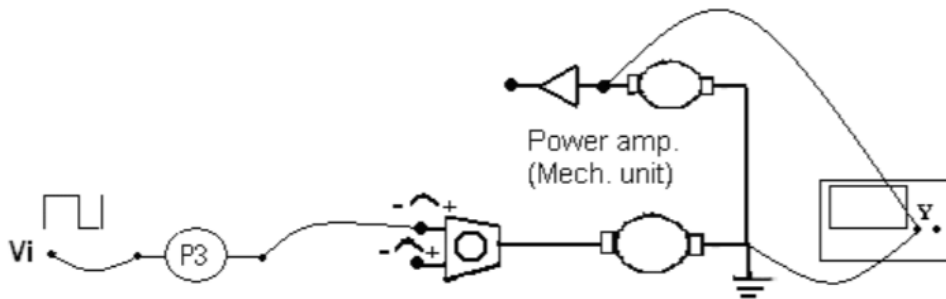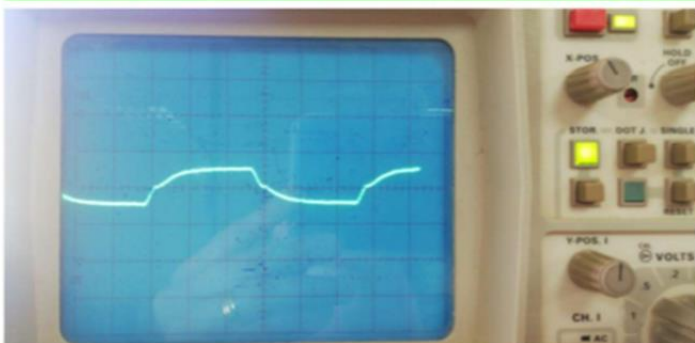7) Estimate the time constant.

Fig5.5

Oscilloscope divisions for all figures are :
Vertical 5v/div
Time 0.5sec/div

Maximum voltage=1*5=5v
5*0.63=3.15v
Time=0.3*0.5=0.15 sec

conclusion:

-when we increase the load the motor speed decrease and the armature current increase .

-It is direct relation between the applied voltage and the motor speed .

-when we increase the applied voltage the taco generator voltage will increase.