Experiment-2

Aim:- To plot open loop and closed loop speed control of DC servomotor

Apparatus: Motor Unit & Control Unit

Theory:- Motor Unit; which comprises a small permanent magnet dc motor, rated voltage 12 V DC, rated current 0.25 Amp, at normal run & 0.4 Amp at full load, the torque 75 gm/cm & max speed in excess of 3200 rpm (open loop).

An overcurrent protection circuit incorporated to exceed current 0.3A. An Eddy current break system for adding disturbance an opto interruptor based speed sensi system.

The control unit has speed measurement system, electronic tachogenerator error detection and forward gain amplifier, motor drive circuit, signal source, break control and digital voltmeter for measurement.

1. **Speed Measurement System:** A uniformly leased disc is attached with motor shaft which interrupt the LED's light following upon a photodiode.

2. **Tachogenerator:** From signal conditioner a proportion DC voltage is generated by a frequency to voltage converters which is brought to a socked upon panel.

3. Error Detector & forward Gain Amplifier: In open loop, the error signals are fed to an amplifier (Kn) the gain of which can be allotted in uniform steps from 3 to 10 in open loop & 3-10 & 20 in close loop.

4. Motor Driver Assembly: It is a unity gain amp. designed to deliver necessary current to the motor. A current limit is incorporated with this circuit. A 3½ digit digital voltmeter having +19.99V fsd is provided upon the panel.

5. Signal Source: A DC reference voltage potentiometer provided for set point voltage V_s, a rectangular wave of 1 Hz, having 1 Vpp amplitude for time constant studies.

6. Break Control: A three position switch applies regulated DC voltage to an electromagnet fitted in motor unit for breaking purpose.

Procedure:- 1. Set up V_R = 0.7V, the reference voltage which is adjusted by given potentiometer & measured at given socket.

2. Connect DVM with the feedback signal socket 4 = Tacho output.

3. Note the speed.

4. Record RPM & V_T volts for successive gains

Result: 4.3V is the open loop cut off voltage.

Open Loop:

Gain	Voltage	RPM
3	1.85	2080
4	2.8	3045
5	3.5	3700
6	4.5	4760
7	4.1	5430
8	4.2	5500
9	3.8	5550
10	3.75	5580

Close Loop:

Gain	Voltage	RPM
3	0.41	455
4	0.91	990
5	1.38	1495
6	1.9	2050
7	2.34	2513
8	2.31	3020
9	3.26	3516
10	3.71	3945