	DEHRADUN INSTITUTE OF TECHNOLOGY		LABORATORY MANUAL
	<u>PRACTICAL INSTRUCTION SHEET</u>		
	EXPERIMENT TITLE : To study DC position Control System		
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DEPTT. : Electrical Engineering	LABORATORY : Control System EA5220		SEMESTER : V

Objective: To study DC position Control System.

Apparatus Used:

Name of the apparatus	Range	Quantity
1. DC Position Control System		1

Theory

In modern control terminology the term “Servomechanism” is restricted to feedback control systems in which controlled variable is mechanical position.

In its simplest form, the output (controlled) and derived (reference) position θ_1 and θ_2 are respectively measured and compared by a potentiometer pair whose output voltage is proportional to the error in angular position $\theta E = \theta_1 - \theta_2$. The error voltage is amplified and applied to servomotor which positions the load and output pot such that the error is reduced to zero.


The position control systems have innumerable applications, namely, Machine tool position control, constant tension control of sheet rolls in paper mills, Radar tracking systems, Roll stabilization of ships, Positioning of heavy guns on the tanks for defence application etc.

Circuit Diagram-



Fig 3. DC Position Control System

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PROCEDURE:

1. Before switching on the main panel, see that the switches SW3, SW4 (On the LHS panel) are in downward position i.e. ON position.
2. Ensure that SW1 and SW2 are in the OFF position i.e. upward position.
3. Keep the input potentiometer P1 in 10 degree position.
4. Potentiometer P3 (amplifier gain adjust) should be in mid position.
5. Now switch ON the main unit. LED 'R' and LED 'G' should glow.

Operation without Feedback (SW1 in OFF position i.e. tacho-out)

Now slowly advance the input potentiometer P1 in clockwise direction. The output potentiometer along with load will be seen to be following the change in the input potentiometer. When the input is disturbed, the null indicator will be showing some indication but when the output reaches desired position, again the null indicator indicates almost zero. It may be noted that when input pot is moved in anticlockwise direction, the output pot P2 also moves in the reverse direction.


Step Change in Input:

Now change the input pot in a step fashion (in fact approximating step input). The output will be observed to change in oscillatory mode before it settles to a final position. The tendency for oscillations is found to be dependent on the amplifier gain setting.

Operation with stabilizing Feedback:

1. Now put the SW1 switch in lower position i.e. tacho in position, SW2 must be in downward position i.e. degenerative mode. Keep P4 in fully anticlockwise direction.
2. The system can be tested for operation.
3. Now take the pot P1 to 180 degree position & effect the step input change in one of the directions, output again indicates oscillations. Now advance the pot P4 in clockwise direction the output now is observed to follow the input in a smooth fashion without oscillations. If the P4 pot is too much advanced, the output now follows input in a sluggish fashion indicating over-damped system. NOW TAKE THE POT T1 TO 180N DEGREE POSITION.
4. Now put the switch SW2 in upward position i.e. regenerative mode. Now if the P1 is disturbed, the output pot P2 is found to oscillate continuously around the desired position. As the amount is observed to vary. DO NOT OPERATE THE D.C. POSITION CONTROL IN REGENERATIVE MODE FOR A LONG TIME.

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Observation Table:

1. Plot the output angle versus input angle for both the systems i.e. without and with stabilizing feedback.

S.No.	Input	Output	Without Stabilizing feedback	remark
1				
2				
With Stabilizing feedback degenerative mode				
1				
2				
With Stabilizing feedback regenerative mode				
1				
2				

RESULT:

Precaution:

1. Please do not cross zero degree position by moving pot P1 i.e. do not operate between 350 degrees and 10 degrees.
2. Do not try to rotate output potentiometer by hand. This may damage the potentiometer.

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