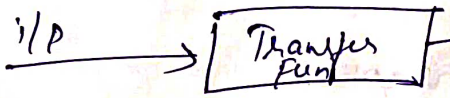
Transfer Function of control system.

Transfer function represents the relation b/w the output signal of a control system and the i/p signal, for all the possible i/p variable.



i/p is represented by R(s)
o/p is represented by C(s)

$$G(s) = \frac{C(s)}{R(s)} = R(s) \cdot G(s) = C(s)$$

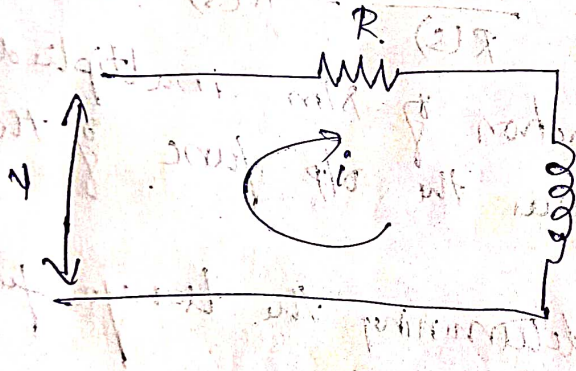
Transfer function of s/m multiplied by the i/p function gives the o/p func of the s/m.

Procedure for determining the transfer function of the control system

1. We form the equations for the s/m.
2. Now we take Laplace transform of the s/m. equations, assuming initial conditions as zero.
3. Specify s/m o/p and i/p.
4. Lastly take the ratio of Laplace transform of the output of the i/p and the Laplace from which is required transfer function.

Methods :-

* Block diagram method
  - Block diagram reduction techniques are applied to obtain the desired transfer function
* Signal flow Graph :
  - The modified form of a block diagram
  - Further Shorten method of control sys



Voltage = i/p current = o/p.

$$V = Ri + L\frac{di}{dt}$$

apply Laplace transform, we get

$$V(s) = RI(s) + L\left[sI(s) - i(0^+)\right]$$

∴ initially inductor acts as open, hence $i(0^+) = 0$

$$V(s) = I(s)(R + Ls)$$

$$G(s) = \frac{I(s)}{V(s)} = \frac{1}{R+Ls}$$

$$= \frac{1/L}{s+R/L}$$

Polu

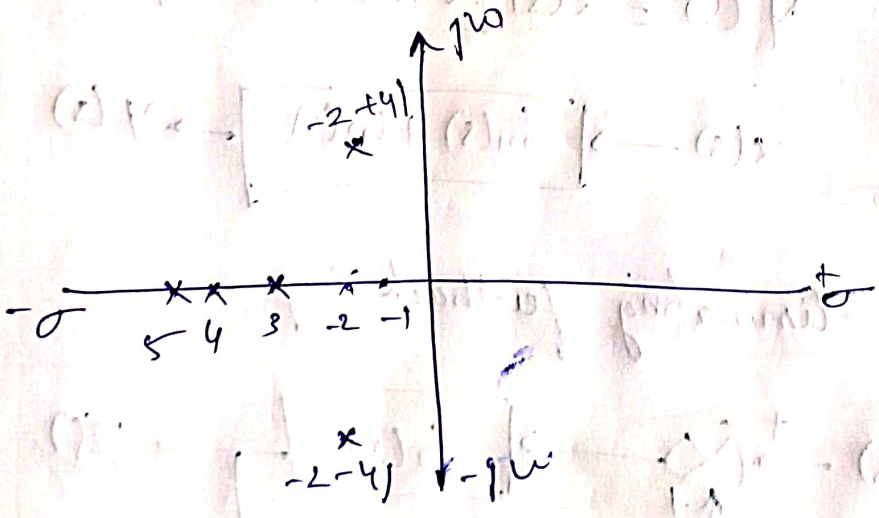
$$G(s) = \frac{(s+1)(s+2)}{(s+3)(s+4)(s+5)(s+2-4j)(s+2+4j)}$$

$$Zeros = \frac{(s+1)(s+2)}{0}$$

$$Zeros = -1, -2$$

$$polu = \frac{0}{(s+3)(s+4)(s+5)(s+2-4j)(s+2+4j)}$$

$$polu = -3, -4, -5, -2+4j, -2-4j$$



polu → x

Zeros → •