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CONTROL SYSTEMS (10M).

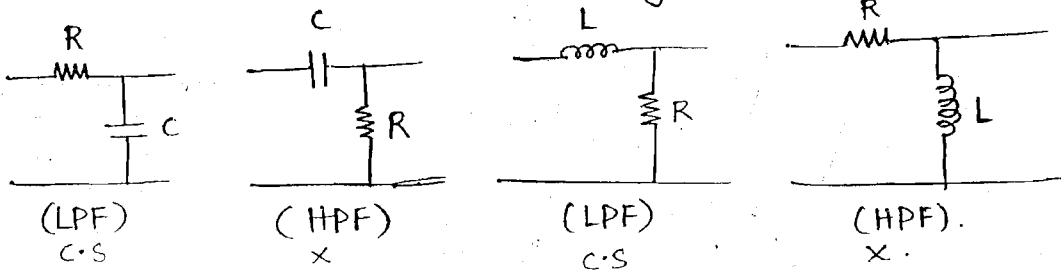
- ① T.F, B.D, SFG \rightarrow (1M) (or) (2M)
- ② TDA $\left\{ \begin{array}{l} \rightarrow \text{Transient Analysis.} \\ \rightarrow \text{Steady state Analysis} \end{array} \right. \rightarrow$ (2M)
- ③ Stability $\left\{ \begin{array}{l} \rightarrow \text{Time domain techniques.} \rightarrow \text{RH/RL} \\ \rightarrow \text{Freq.} \quad \quad \quad \quad \rightarrow \text{BP/NP} \end{array} \right. \rightarrow$ (4M)
- ④ Compensators & Controllers.
- ⑤ State space analysis \rightarrow (2M)

= x = x =

T.F: It is the mathematical equivalent model of a system.

$$T.F = \frac{L\{O.P\}}{L\{I.P\}}$$

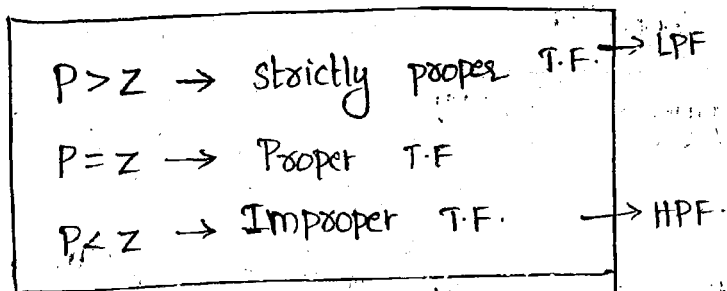
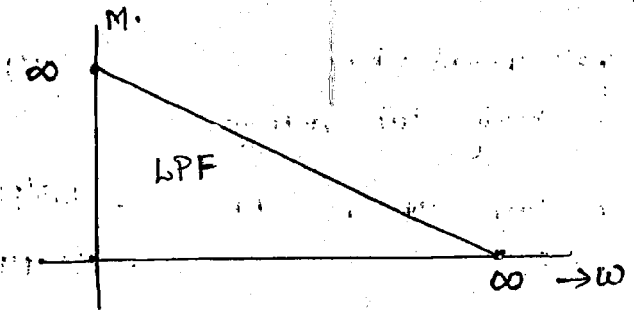
Ex: $\frac{1}{s+1}$ order-1 \Rightarrow No. of Time constants (or) No. of Memory elements.



- * All control systems ~~of~~ are LPF
- * The main objective of C.S is to get Desired o.p. (or) Accurate o.p.
- * Standard form of system:

$$\text{Sys} = \frac{K(1+ST_1)(1+ST_2)\dots\dots\dots}{S^n(1+ST_a)(1+ST_b)\dots\dots\dots}$$

- * at $\omega=0 \Rightarrow \text{sys} = \infty$
 at $\omega=\infty \Rightarrow \text{sys} = 0$

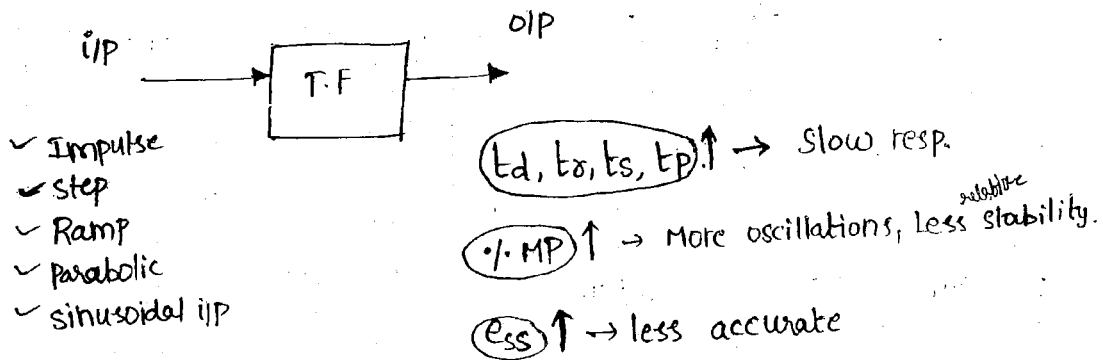


B-D and S-F-G

These are used to get the overall TF of the system.

TDA:

- * To evaluate performance of the system w.r.t time.



FDA:

- * Observing the magnitude and phase of the system by varying frequency.

C.S specifications:

③

- ① Speed \rightarrow $(t_r, t_s) \downarrow \rightarrow$ Quick response
- ② Accuracy \rightarrow $(e_{ss}) \downarrow \rightarrow$ More accurate
- ③ Stability \rightarrow $\begin{cases} \uparrow \uparrow \rightarrow \text{More Relative stable (Adv)} \\ \text{Slow resp. (Dis adv)} \\ \downarrow \downarrow \rightarrow \text{Less relative stable (Dis)} \\ \text{More oscillatory (Dis)} \end{cases}$

Moderate $\begin{cases} G.M \rightarrow 5\text{dB to } 10\text{dB} \\ P.M \rightarrow 30^\circ \text{ to } 40^\circ \end{cases}$

- ④ Sensitivity w.r.t Disturbance/Noise/Environmental conditions \Downarrow Less.

* The best system is the one it should be highly sensitive w.r.t 'i/p' and insensitive w.r.t Dist/Noise/E.C.

* Speed, Accuracy \rightarrow TDA

Stability \rightarrow FDA

* Transient $\xrightarrow{\text{deal with}}$ Speed.

Steady state \rightarrow Accuracy

Stability:

* All the stability techniques are used to find only "Closed loop" system stability.

① The open loop T.F of a unity feedback system is

$$G(s) = \frac{1}{(s+1)} \quad \text{The system time constant is.}$$