CONTROL SYSTEMS [10M].

① T.F, B.D, SFG → (1M) (or) (2M)

② TDA → Transient Analysis. / Steady state Aanalysis → (2M)

③ Stability → Time domain techniques. → RH/RL / Freq " " → BP/NP → (4M)

④ Compensators & Controllers.

⑤ State space analysis → (2M)

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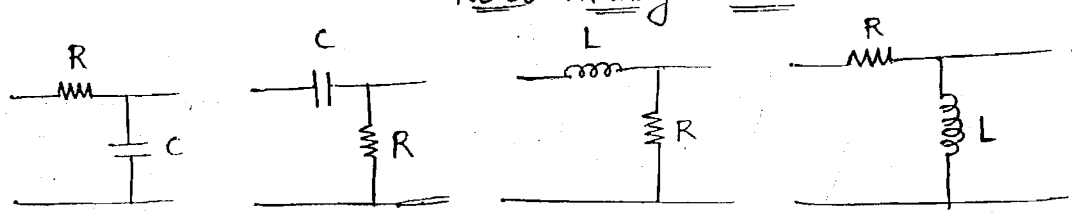
T.F: It is the Mathematical equivalent model of a system.

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

Ex: $\frac{1}{S+1}$ order - 1 ⇒ No. of Time constants (or) No. of memory elements.

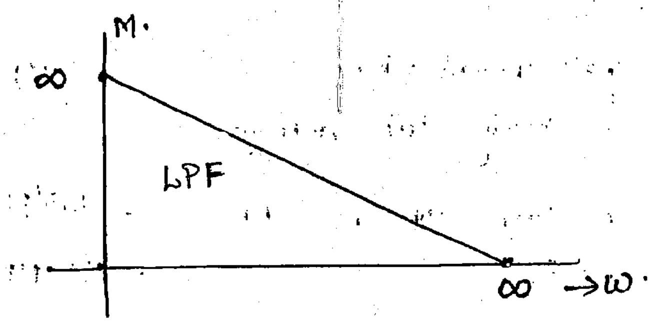


(LPF) C.S — (HPF) × — (LPF) C.S — (HPF). ×

* 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:

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

* at $\omega = 0 \Rightarrow sys = \infty$.
  at $\omega = \infty \Rightarrow sys = 0$



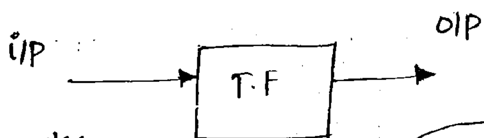
$P > Z$ → strictly proper T.F.	→ LPF
$P = Z$ → Proper T.F	
$P < Z$ → Improper T.F.	→ HPF.

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.



- ✓ Impulse
- ✓ step
- ✓ Ramp
- ✓ parabolic
- ✓ sinusoidal i/p

(t_d, t_r, t_s, t_p) ↑ → Slow resp.

(%MP) ↑ → More oscillations, Less relative stability.

(e_{ss}) ↑ → less accurate

FDA:

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

C.S specifications :

① Speed → (t_r, t_s) ↓ → Quick response

② Accuracy → (e_{ss}) ↓ → More accurate

③ Stability → GM & PM.
- ↑↑ → More Relative stable (Adv) ; Slow resp. (Dis adv).
- ↓↓ → Less relative stable (Dis) ; More oscillatory (Dis).

Moderate: G.M → 5 dB to 10 dB
P.M → 30° to 40°

④ Sensitivity w.r.t Disturbance / Noise / Environmental conditions
↳ 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 → TDA.
Stability → FDA

* Transient —deal with→ Speed.
Steady state → 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

$$G(s) = \frac{1}{(s+1)}$$

. The system time constant is.