

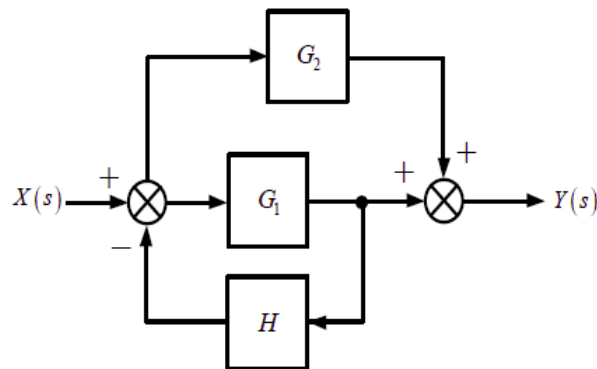
# Gate 2021 Assignment

EE:1205 Signals and Systems  
Indian Institute of Technology, Hyderabad

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## I. QUESTION EC 13

The block diagram of a feedback control system is shown in the figure .



The transfer function  $\frac{Y(s)}{X(s)}$  of the system is :

## II. SOLUTION

TABLE 0  
INPUT PARAMETERS

Parameter	Used to denote	Values
$n$	Number of forward paths	2
$\Delta_k$	The value of $\Delta$ which is not touching the $k^{th}$ forward path	$\Delta_1 = 1, \Delta_2 = 1$
$\Delta$	1 - sum of the loop gains	$1 - G_1H$
$P_k$	$k^{th}$ forward path gain	$P_1 = G_1, P_2 = G_2$

According to Mason's gain formula , transfer function can be given as :

$$\text{TF} = \frac{\sum_{k=1}^n P_k \Delta_k}{\Delta} = \frac{P_1 \Delta_1 + P_2 \Delta_2}{\Delta} \quad (1)$$

$$= \frac{G_1 + G_2}{1 + G_1H} \quad (2)$$