EE23BTECH11217 - Prajwal M*

Exercise 9.1

12 For the block diagram shown in the figure, the transfer function $\frac{Y(s)}{R(s)}$ is

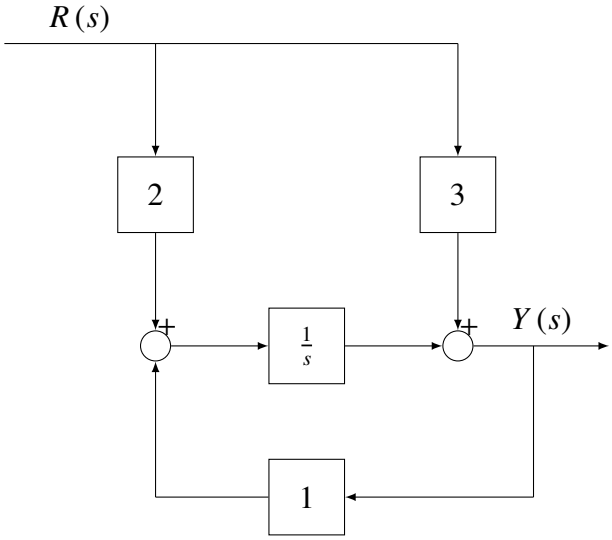

Fig. 1. block diagram

Solution:

Parameter	Description	Value
$Y(s)$	Output node variable	
$R(s)$	Input node variable	
$\frac{Y(s)}{R(s)}$	Transfer function	?
P_1	Forward path gain a-b-c	$\frac{2}{s}$
P_2	Forward path gain a-c	3
Δ_1	Determinant of forward path a-b-c	1
Δ_2	Determinant of forward path a-c	1
Δ	Determinant of system	$1-\frac{1}{s}$
n	Number of forward path	2

TABLE I
Parameters

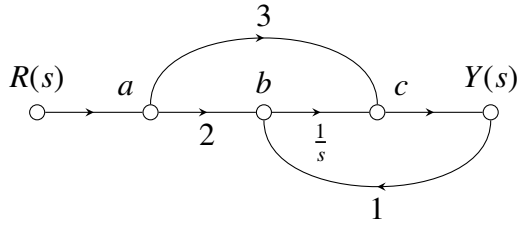

Fig. 2. signal flow graph

Using Mason's Gain Formula for Fig. 2,

$$\frac{Y(s)}{R(s)} = \frac{\sum_{i=1}^{n} P_i \Delta_i}{\Delta} \tag{1}$$

$$= \frac{P_1\Delta_1 + P_2\Delta_2}{\Delta} \tag{2}$$

$$= \frac{\frac{2}{s} + 3}{1 - \frac{1}{s}} \tag{3}$$

$$\frac{Y(s)}{R(s)} = \frac{3s+2}{s-1} \tag{4}$$

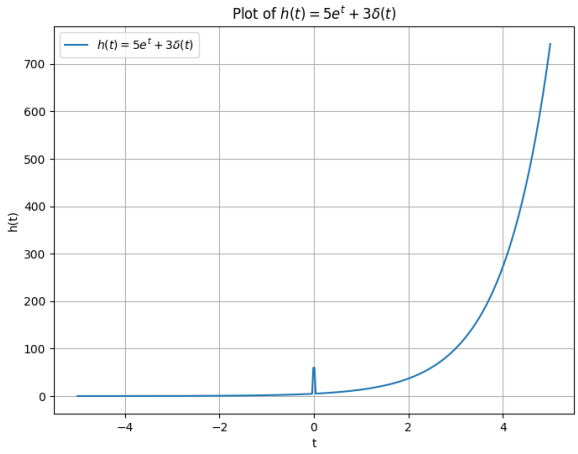

Fig. 3. signal flow graph