GATE:EE/63

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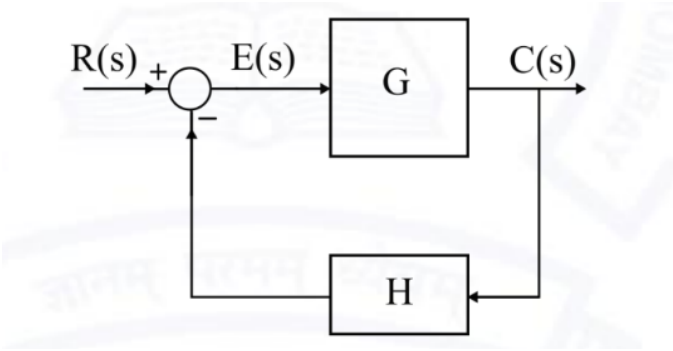
Question: For the closed loop system shown , the transfer function $\frac{E(s)}{R(s)}$ is



(a) $\frac{G}{1+GH}$
(b) $\frac{GH}{1+GH}$
(c) $\frac{1}{1+GH}$
(d) $\frac{1}{1+G}$

(GATE EE 2021)

Solution:
Given,

symbol	description
G	Forward path gain
H	Feedback path gain
$R(s)$	Input signal
$C(s)$	Output signal
$E(s)$	Error signal

TABLE I
PARAMETERS

$$C(s) = G \times E(s) \tag{1}$$

$$\text{Feedback signal} = H \times C(s) \tag{2}$$

Error signal = Input signal - Feedback signal

$$E(s) = R(s) - H \times C(s) \tag{3}$$

from eq (1),

$$E(s) = R(s) - H \times G \times E(s) \tag{4}$$

$$E(s) + H \times G \times E(s) = R(s) \tag{5}$$

$$\therefore \frac{E(s)}{R(s)} = \frac{1}{1+GH} \tag{6}$$