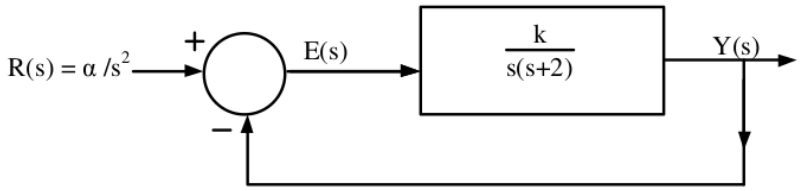
EE23BTECH11024 - G.Karthik Yadav*

GATE 2023 EC 41

1. A Closed loop systen is shown in the figure where $k > 0$ and $\alpha > 0$.
The Steady State error due to a ramp input $(R(s) = \alpha s^{-2})$ is given by (GATE 2023 EC 41)



1) $\frac{2\alpha}{k}$
2) $\frac{\alpha}{k}$
3) $\frac{\alpha}{2k}$
4) $\frac{\alpha}{4k}$

Solution:

Symbol	Parameters	value
$R(s)$	Ramp input signal	αs^{-2}
$G(s)$	Open Loop transfer function	$\frac{k}{s(s+2)}$
e_s	Steady State Error	?
K_v	velocity constant	?

TABLE I
INPUT PARAMETERS

from table I The Steady State error is

$$e_s = \frac{\alpha}{K_v} \tag{1}$$

$$G(s) = \frac{k}{s(s+2)} \tag{2}$$

From the figure

$$K_v = \lim_{s\to 0} sG(s) \tag{3}$$

$$= \lim_{s\to 0} s\frac{k}{s(s+2)} \tag{4}$$

$$K_v = \frac{k}{2} \tag{5}$$

from eq (1)

$$e_s = \frac{2\alpha}{k} \tag{6}$$