HW2 Solutions

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<div dir="rtl">

۱   بخش مقدماتی (۳۵ نمره)

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Disclaimer:
This is the solution manual to the homework assigned to students of Digital Control - Dr.Talebi.
We do not guarantee that this solution is precise and thorough so please contact your TA to propose your innovative
solutions and/or any probable mistakes.

<div dir="rtl">سوال اول</div>

Solution:

$\frac{X(z)}{z} = \frac{2z^2+1}{(z-2)^2(z-1)} = \frac{9}{(z-2)^2} - \frac{1}{z-2} + \frac{3}{z-1}$

then

$X(z) = \frac{9z^{-1}}{(1-2z^{-1})^2} - \frac{1}{1-2z^{-1}} + \frac{3}{1-z^{-1}}$
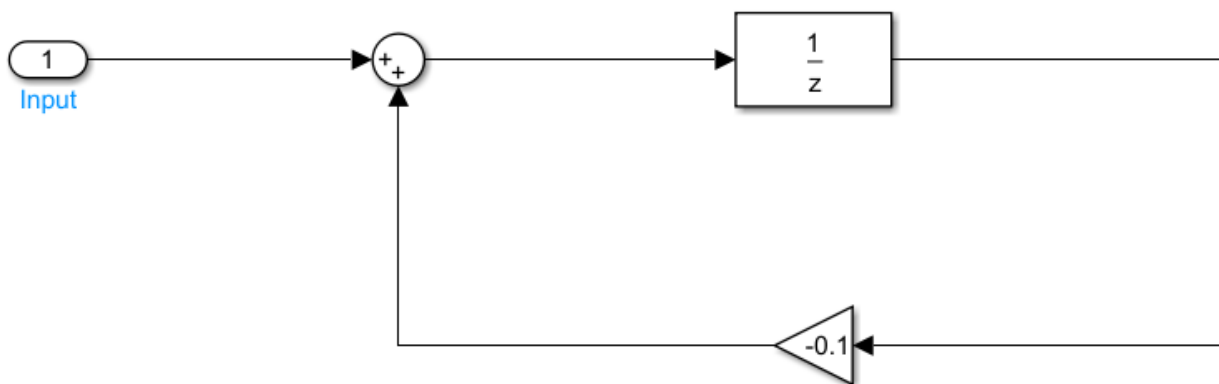
At last we have :

$x(k) = 9k(2^{k-1}) - 2^k + 3$

Firstly : Decompose the Transfer function to the following :

$G(z) = \frac{1}{z-0.1} \frac{z-2}{z^2-0.5z+1}$

Realize the first part:
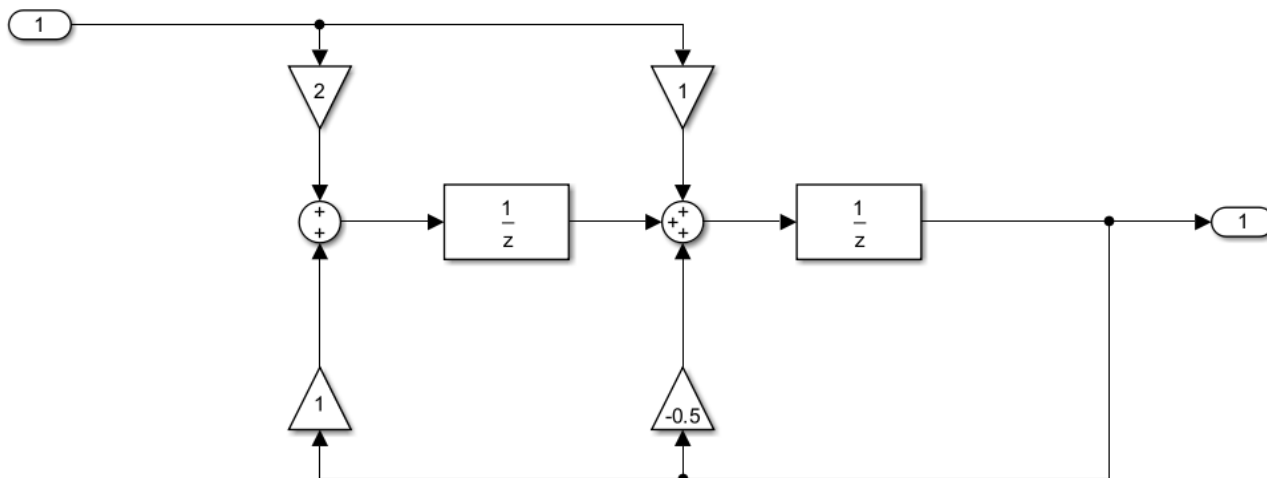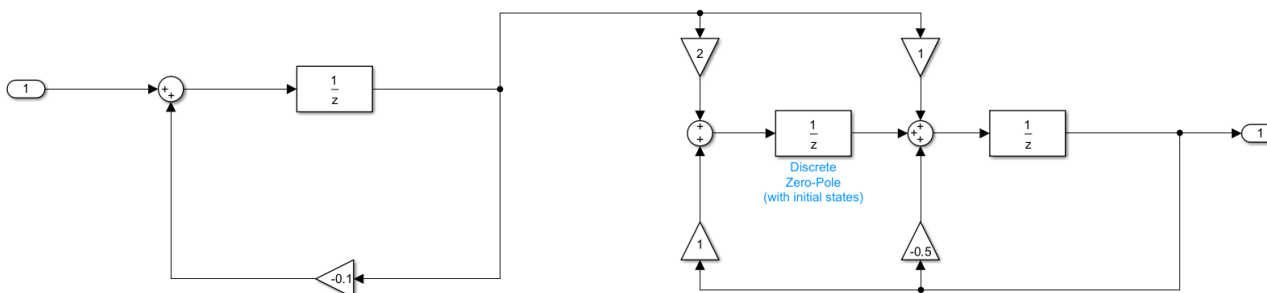
$G_{FP} = \frac{z^{-1}}{1-0.1z^{-1}}$

Now Realize the second part:

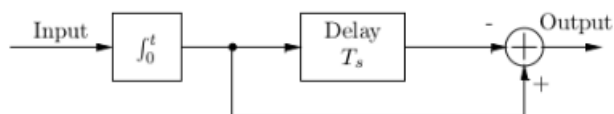$G_{SP} = \frac{z^{-1}-2z^{-2}}{1-0.5z^{-1}+z^{-2}}$

Use Observable Canonical :

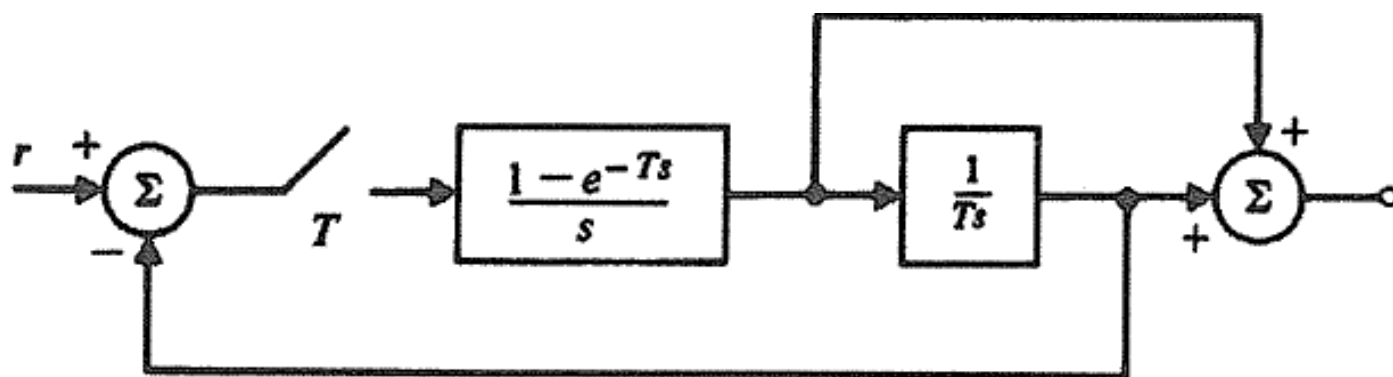Bring the two realized parts together to have the realized block diagram.

$-\frac{1}{s}U(s)e^{-sT} + \frac{1}{s}U(s) = Y(s)$

The transfer function would be:

$G(s) = \frac{1-e^{-sT}}{s}$

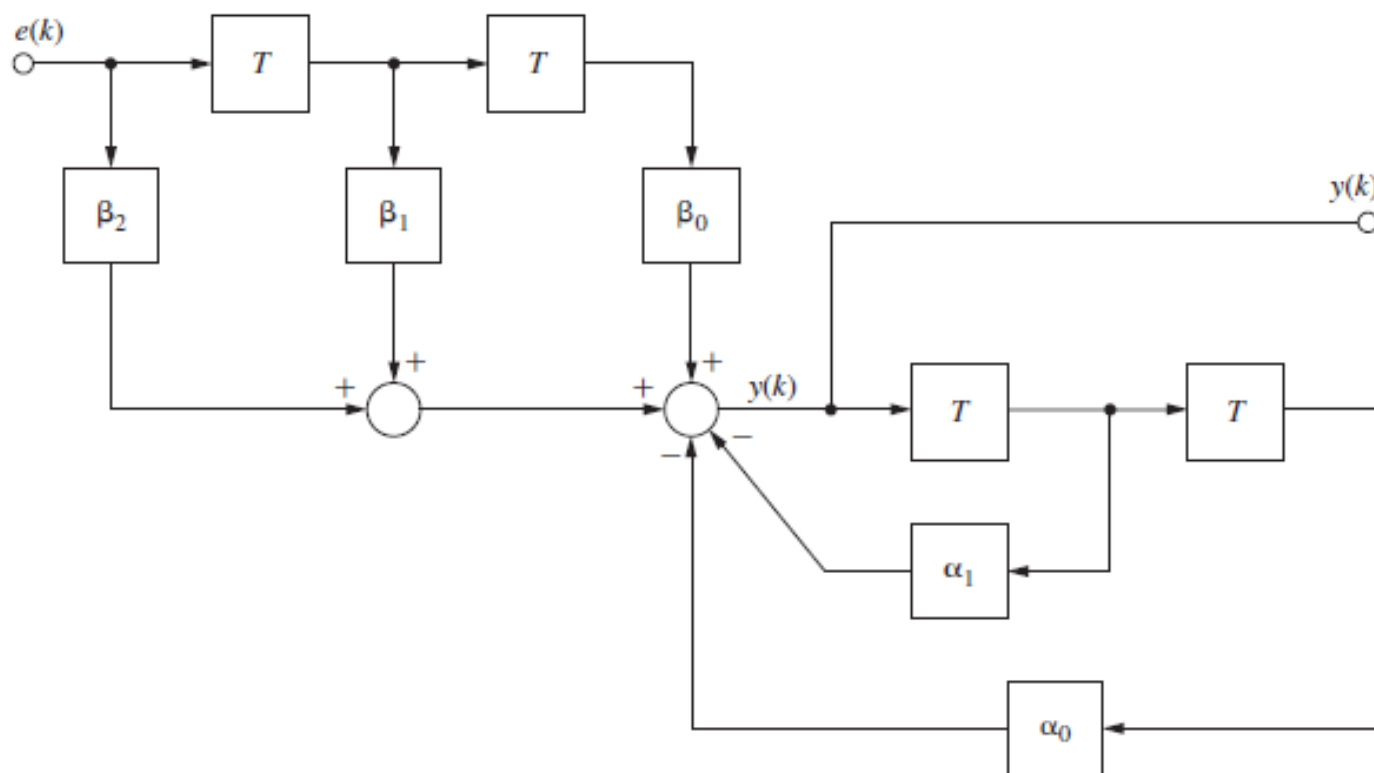This is the ZOH transfer function.

شکل ۱: شکل سوال سوم

شکل ۲: شکل سوال چهارم

۲   بخش متوسط (۳۵ نمره)

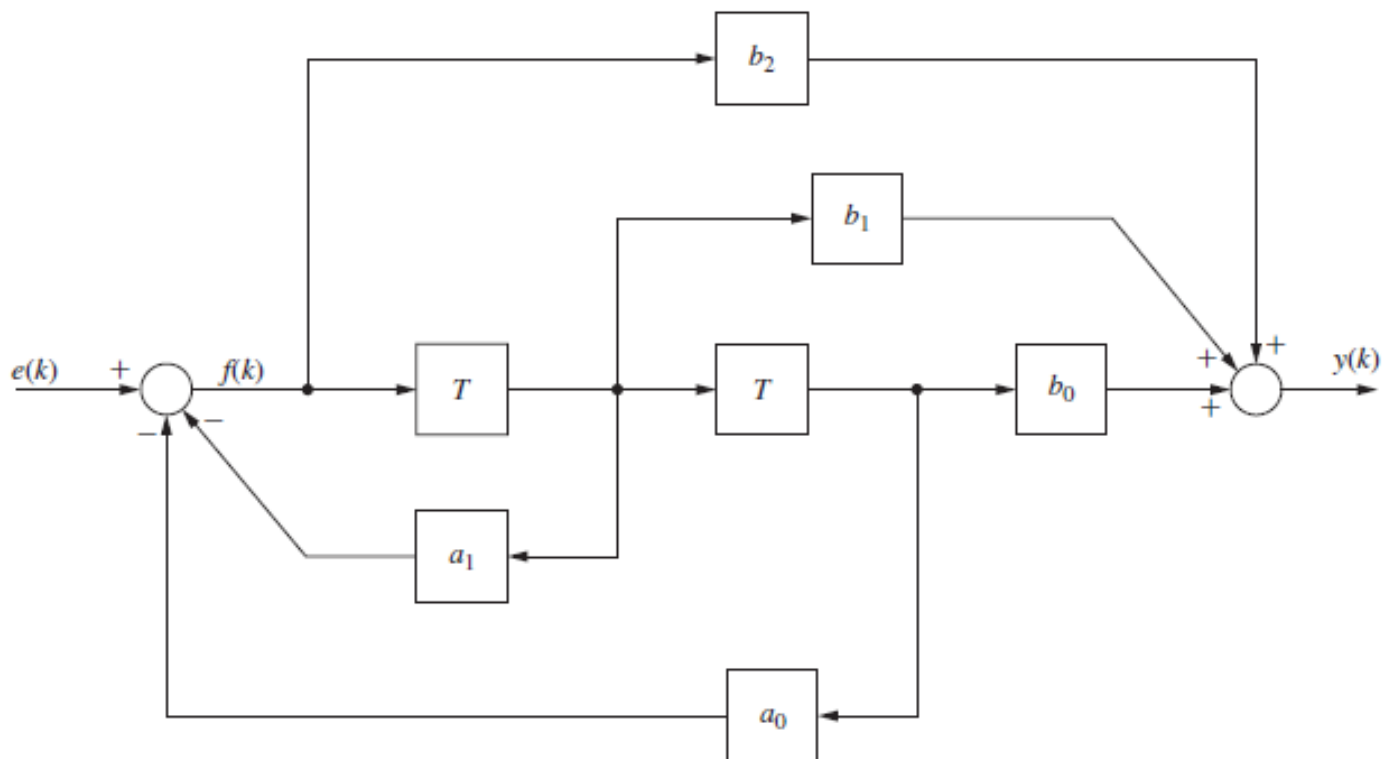حل دو سوال از این بخش الزامی است.

شکل ۳: شکل سوال هفتم

سوال ششم

سوال هفتم

سوال هشتم

سوال نهم

شکل ۴: شکل سوال هشتم

سوال دهم

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۳   بخش تکمیلی (۳۰ نمره)

حل <u>دو سوال</u> از این بخش الزامی است.

سوال یازدهم

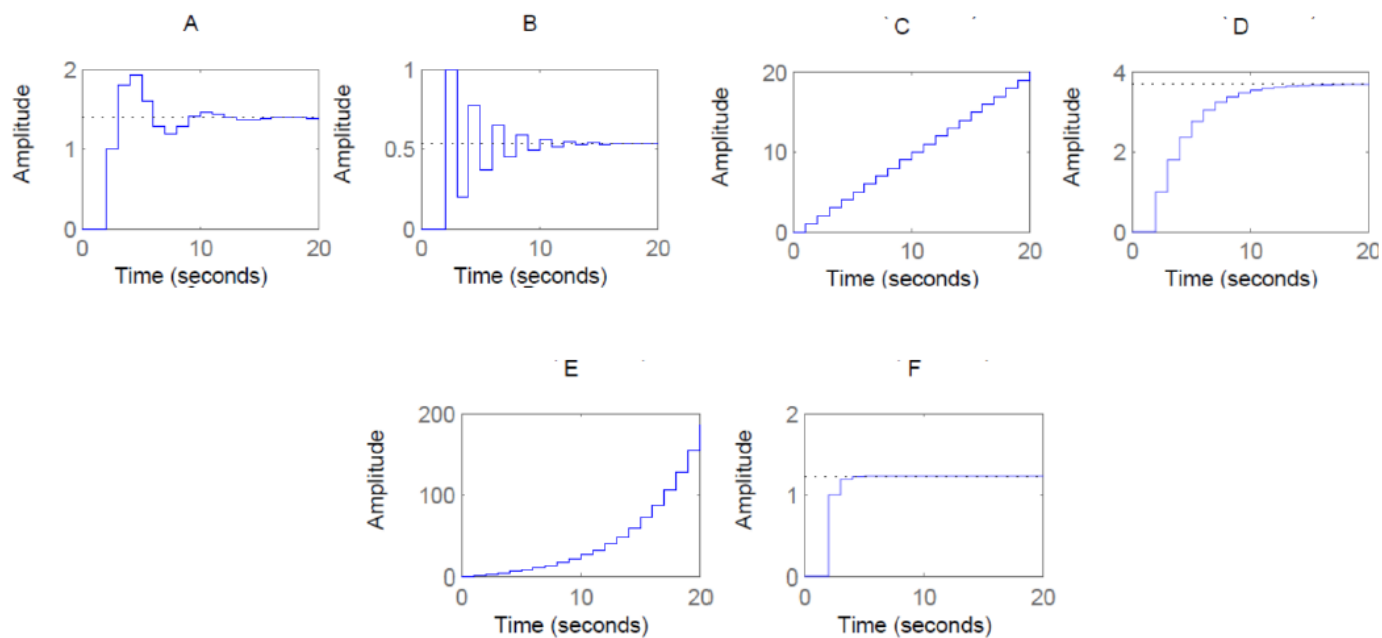سوال دوازدهم

$$G_1(z) = \frac{1}{z^2 + 0.85\square + 0.07}$$

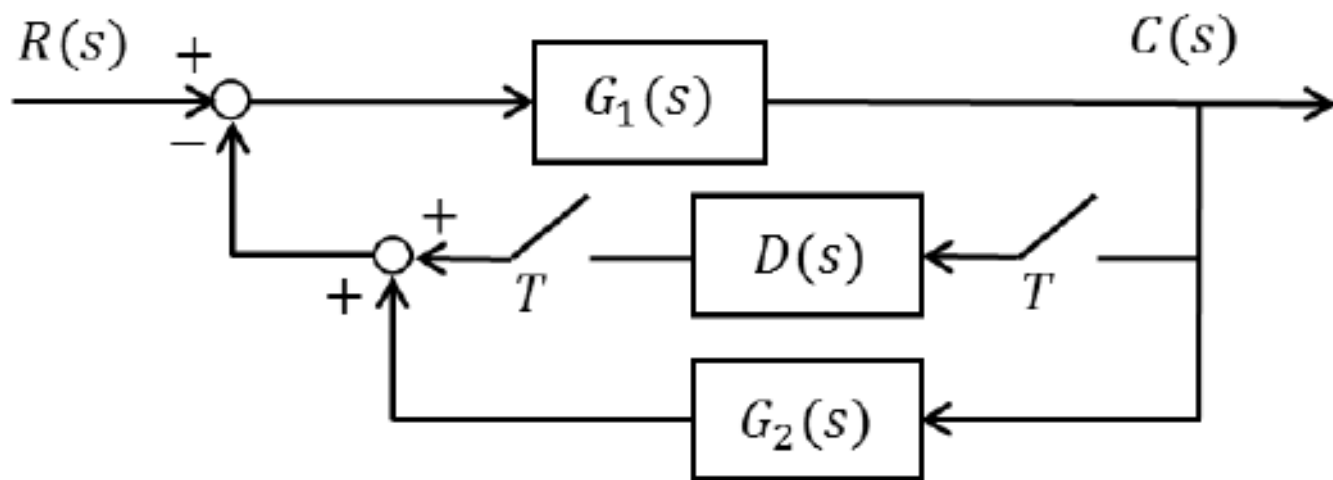$$G_4(z) = \frac{1}{z - 1}$$

$$G_2(z) = \frac{1}{z^2 - 0.85\square + 0.07}$$

$$G_5 = \frac{1}{z^2 - 0.85\square + 0.52}$$
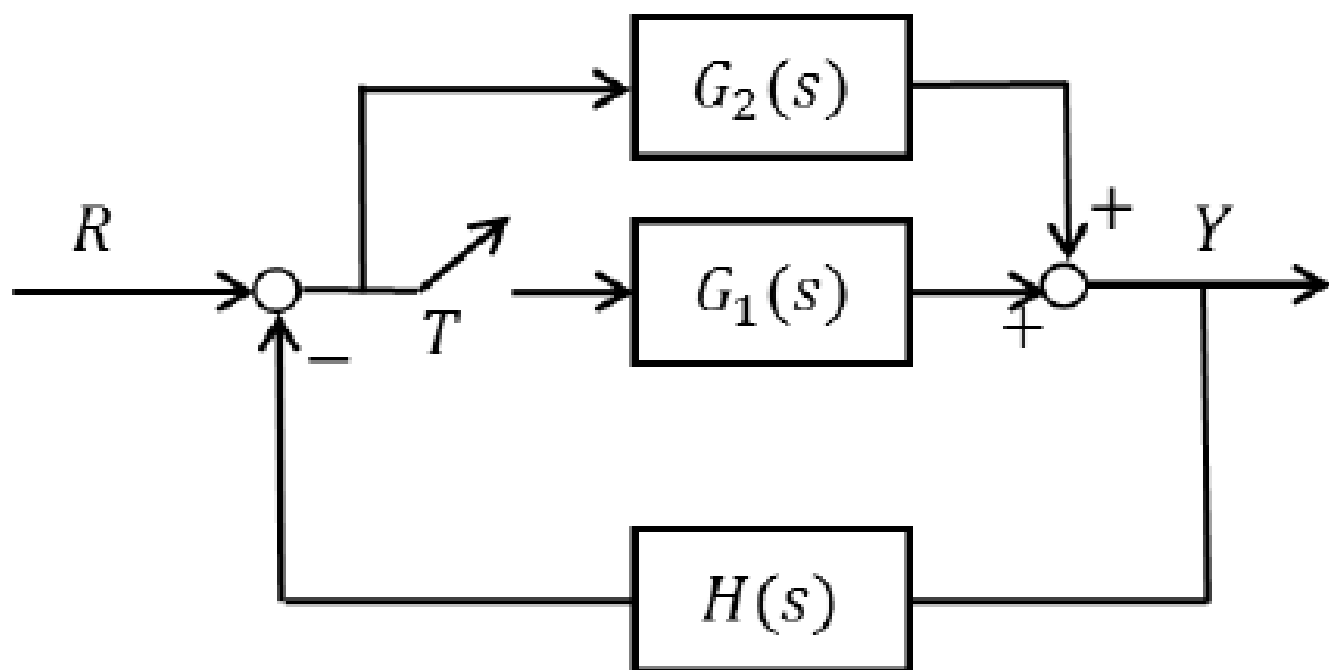
$$G_3(z) = \frac{1}{z^2 - 0.25\square + 0.01}$$

$$G_6(z) = \frac{1}{z - 1.2}$$

A

B

C

D

E

F

شکل ۵: شکل سوال یازدهم

$R(s)$ + $G_1(s)$ $C(s)$

$D(s)$ T T

$G_2(s)$

شکل ۶: شکل سوال دوازدهم

شکل ۷: شکل سوال سیزدهم

سوال سیزدهم

سوال چهاردهم

سوال پانزدهم