(1) $y[n] = \frac{1}{2} y[n-1] + x[n]$ $\quad x[n] = \left(\frac{1}{4}\right)^n$ $\quad y[0] = ?$ ⋮ $y[5] = ?$

a). infinite precision

b). ISOI4T , T

c). ISOI4T , R

$y[-1] = 0$ (initial condition)

$y[0] = \frac{1}{2} \cdot 0 + 1 = 1$

$y[1] = \frac{1}{2} \cdot 1 + \frac{1}{4} = \frac{3}{4}$

$y[2] = \frac{1}{2} \cdot \frac{3}{4} + \frac{1}{16} = \frac{7}{16}$

	a)		b)		c)	
	$x[n]$	$y[n]$	$x[n]$	$y[n]$	$x[n]$	$y[n]$
$n=0$	1	1	$\frac{15}{16}$ (0,1111)			
$n=1$	1/4	3/4	$\frac{4}{16}$ (0,0100)			
$n=2$	1/16	7/16	$\frac{1}{16}$ (0,0001)			
$n=3$	1/64	15/64	0			
$n=4$	1/256	31/256	0			
$n=5$	1/1024	63/1024	0			

b). ISOI4T = $\underline{\quad}_{5}, \_\_\_\_$ ↓ 0

$0,1111 = 15/16$

⋮

$1,0000 = -16/16$

$\Rightarrow \left\{ \frac{-16}{16}, \frac{-15}{16}, \dots \frac{14}{16}, \frac{15}{16} \right\}$

$[x[0]]_T = \frac{15}{16} = 0,1111$

$x[1]_T = \frac{1}{4} = \frac{4}{16} = 0,0100$

$x[2]_T = \frac{1}{16} = 0,0001$

$x[3]_T = \left[\frac{1}{64}\right]_T = \left[\frac{0.25}{16}\right]_T = 0 = 0,0000$

b).

$$y[0] = \left(\left(\frac{1}{2}\cdot 0\right)_T + \frac{15}{16}\right)_T = \frac{15}{16}$$

$$y[1] = \left(\left(\frac{1}{2}\cdot\frac{15}{16}\right)_T + \frac{4}{16}\right)_T = \frac{11}{16}$$

$$\left[\frac{7.5}{16}\right]_T = \frac{7}{16}$$

$$y[2] = \left(\left(\frac{1}{2}\cdot\frac{11}{16}\right)_T + \frac{1}{16}\right)_T = \frac{6}{16}$$

$$\left(\frac{5.5}{16}\right)_T = \frac{5}{16}$$

	a) $x[n]$	a) $y[n]$	b) $x[n]$	b) $y[n]$	c) $x[n]$	c) $y[n]$
$n=0$	1	1	$\frac{15}{16}$ $(0,1111)$	$\frac{15}{16}$ $(0,1111)$		
$n=1$	$1/4$	$3/4$	$\frac{4}{16}$ $(0,0100)$	$\frac{11}{16}$ $(0,1011)$		
$n=2$	$1/16$	$7/16$	$\frac{1}{16}$ $(0,0001)$	$\frac{6}{16}$ $(0,0110)$		
$n=3$	$1/64$	$15/64$	0	$\frac{3}{16}$ $(0,0011)$		
$n=4$	$1/256$	$31/256$	0	$\frac{1}{16}$ $(0,0001)$		
$n=5$	$1/1024$	$63/1024$	0	0 $(0,0000)$		

$$y[3] = \left(\frac{1}{2}\cdot\frac{6}{16}\right)_T + 0 = \frac{3}{16}$$

$$y[4] = \left(\frac{1}{2}\cdot\frac{3}{16}\right)_T + 0 = \left(\frac{1.5}{16}\right)_T = \frac{1}{16}$$

$$y[5] = \left(\frac{1}{2}\cdot\frac{1}{16}\right)_T + 0 = \left(\frac{0.5}{16}\right)_T = 0$$

c)

$$\left(x[0]\right)_R = \left(1\right)_R = \frac{15}{16}$$

$$\left(x[1]\right)_R = \left(\frac{1}{4}\right)_R = \frac{4}{16}$$

$$\left(x[2]\right)_R = \frac{1}{16}$$

$$\left(x[3]\right)_R = \left(\frac{1}{64}\right)_R = \left(\frac{0.25}{16}\right)_R = 0$$

$$y[0] = \left(\left(\frac{1}{2}\cdot 0\right)_R + \frac{15}{16}\right)_R = \frac{15}{16}$$

$$y[1] = \left(\left(\frac{1}{2}\cdot\frac{15}{16}\right)_R + \frac{4}{16}\right)_R = \frac{12}{16}$$

$$\left(\frac{7.5}{16}\right)_R = \frac{8}{16}\ !$$

	a) $x[n]$	a) $y[n]$	b) $x[n]$	b) $y[n]$	c) $x[n]$	c) $y[n]$
$n=0$	1	1	$\frac{15}{16}$ $(0,1111)$	$\frac{15}{16}$ $(0,1111)$	$\frac{15}{16}$ $(0,1111)$	$\frac{15}{16}$
$n=1$	$1/4$	$3/4$	$\frac{4}{16}$ $(0,0100)$	$\frac{11}{16}$ $(0,1011)$	$4/16$	$12/16$
$n=2$	$1/16$	$7/16$	$\frac{1}{16}$ $(0,0001)$	$\frac{6}{16}$ $(0,0110)$	$1/16$	$7/16$
$n=3$	$1/64$	$15/64$	0	$\frac{3}{16}$ $(0,0011)$	0	$4/16$
$n=4$	$1/256$	$31/256$	0	$\frac{1}{16}$ $(0,0001)$	0	$2/16$
$n=5$	$1/1024$	$63/1024$	0	0 $(0,0000)$	0	$1/16$
						$1/16$
						$1/16$
						$\vdots$
						Limit Cycle

$$y[2] = \left(\left(\frac{1}{2}\cdot\frac{12}{16}\right)_R + \frac{1}{16}\right)_R = \frac{7}{16}$$

$$y[3] = \left(\left(\frac{1}{2}\cdot\frac{7}{16}\right)_R + 0\right)_R = \left(\frac{3.5}{16}\right)_R = \frac{4}{16}$$

$$y[4] = \left(\frac{1}{2}\cdot\frac{4}{16}\right)_R = \frac{2}{16}$$

$$y[5] = \left(\frac{1}{2}\cdot\frac{2}{16}\right)_R = \frac{1}{16}$$

$$y[6] = \left(\frac{1}{2}\cdot\frac{1}{16}\right)_R = \left(\frac{0.5}{16}\right)_R = \frac{1}{16}$$