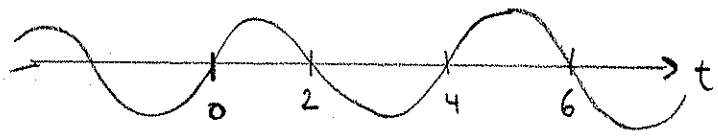
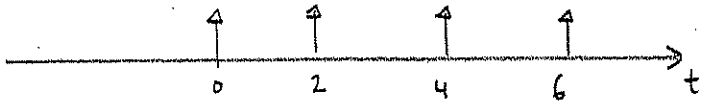
EE 3054
QUIZ 2
SOLUTION

SUMMER 2007

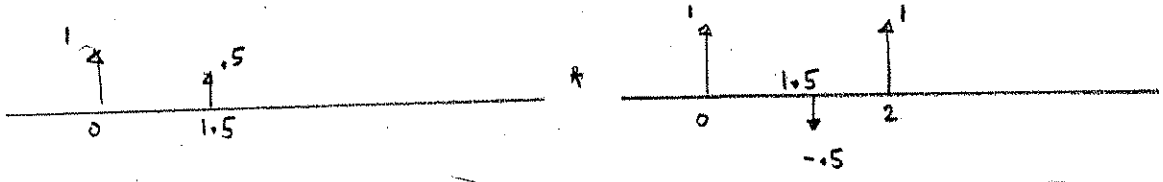
① $x(t) = \sin(\frac{\pi}{2}t)$

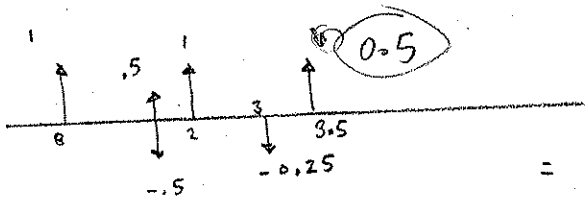


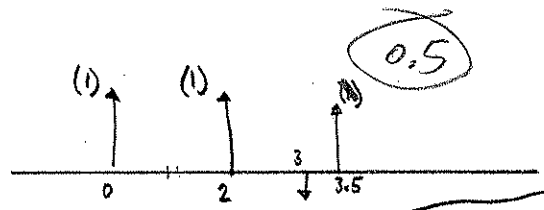
$f(t) = \sum_k \delta(t-2k)$

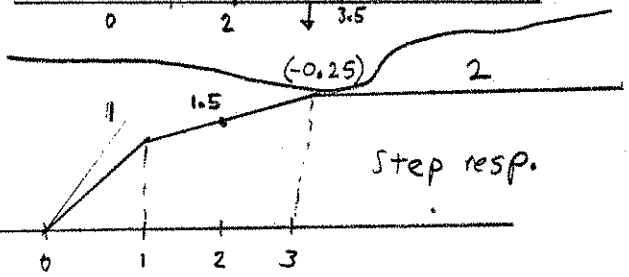


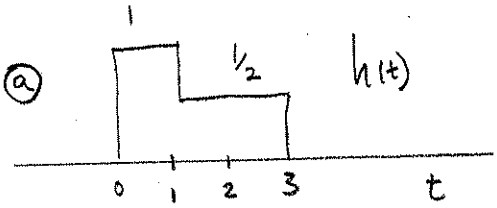
$s(t) = x(t) \cdot f(t)$
$= 0$

② 

$=$ 

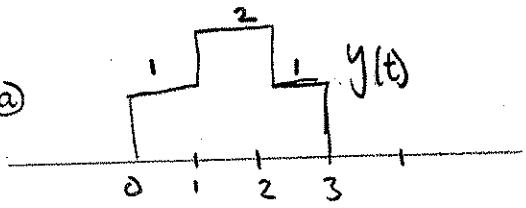
$=$ 

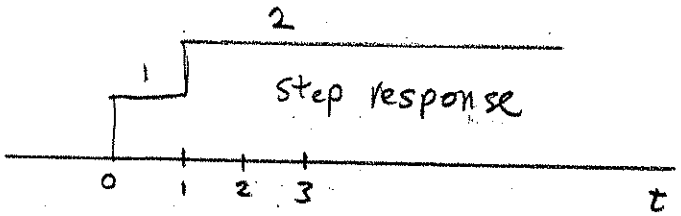


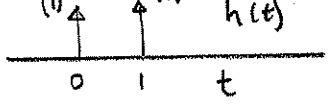
③ (a) 

(b) Step resp.

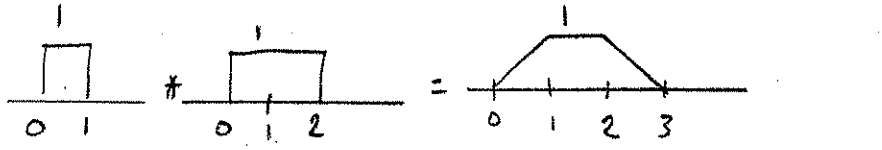
(c) dc gain = 2.

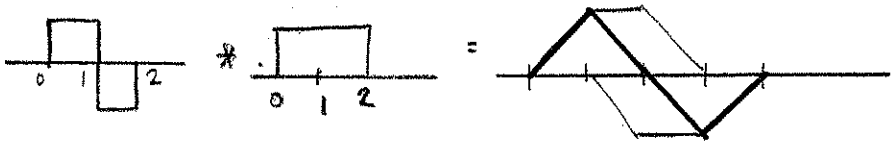
④ (a) 

(b) 

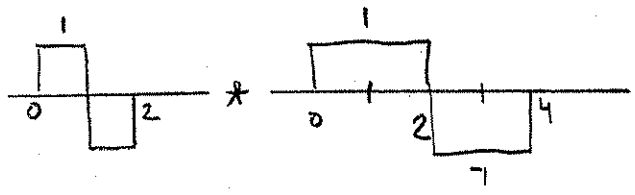
(c) 

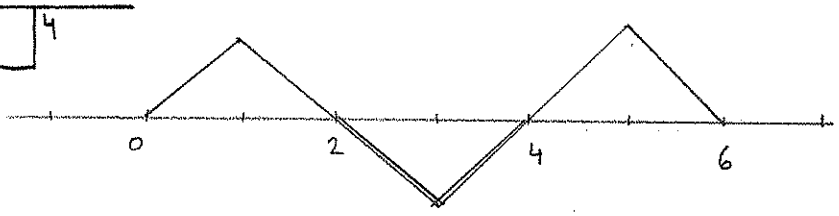
$h(t) = \frac{d}{dt}(\text{step resp.})$

⑤ 

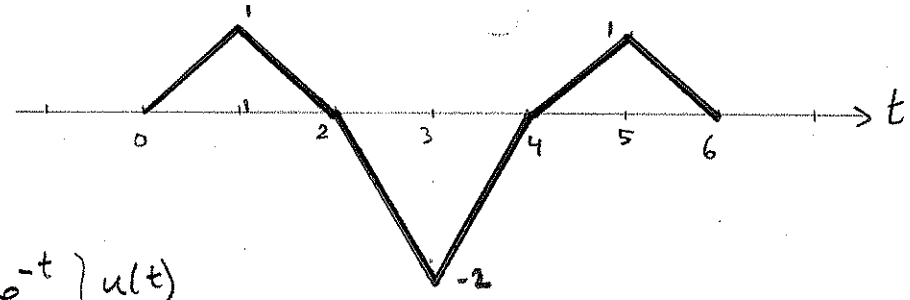


So





(5)



(6) $h(t) = \{3e^{-t} + 2e^{-2t} + e^{-t}\}u(t)$

a) $H(s) = \frac{3}{s+1} + \frac{2}{s+2} + \frac{1}{s+1} = \frac{4}{s+1} + \frac{2}{s+2} = \frac{4(s+2) + 2(s+1)}{(s+1)(s+2)}$

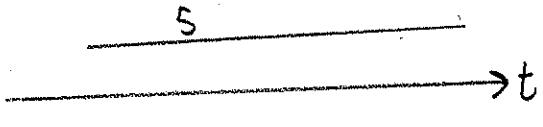
$$H(s) = \frac{6s + 10}{s^2 + 3s + 2}$$

b) $y'' + 3y' + 2y = 6x' + 10x$

c) poles $\boxed{s = -1,\ s = -2}$

d) dc gain $= H(s=0) = 5$

e)

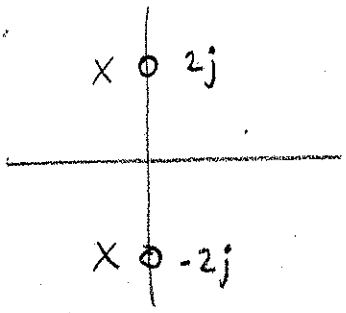


f) steady state output = 5.

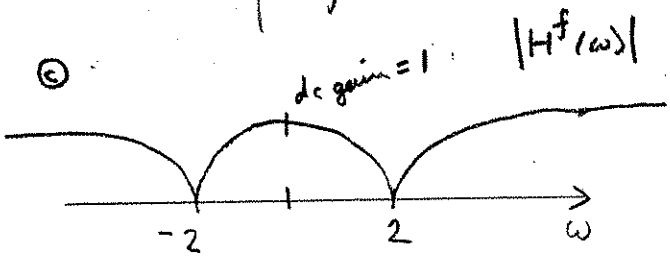
(7) $\frac{K(s-2j)(s+2j)}{(s+1-2j)(s+1+2j)} = \frac{(s^2+4)K}{s^2+2s+5} = H(s)$

(a)

(b)



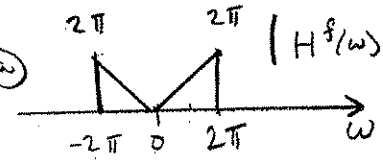
(c)



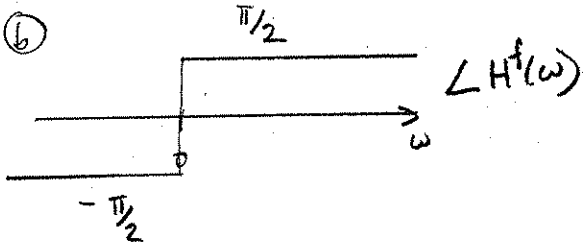
$H(s=0) = \frac{4}{5}K = 1 \rightarrow K = \frac{5}{4} = 1.25$

$y'' + 2y + 5y = 1.25x'' + 5x$

(d) $h(t) = Ae^{-t}\cos(2t + \theta)u(t)$

(8) (a) 

3

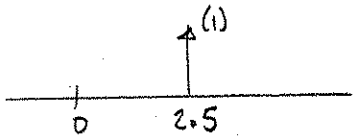
(6) 

(c) $y(t) = 2\pi \cos(\pi t + \frac{\pi}{2})$

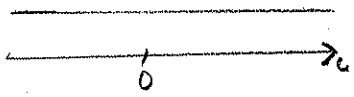
$= -2\pi \sin(\pi t)$

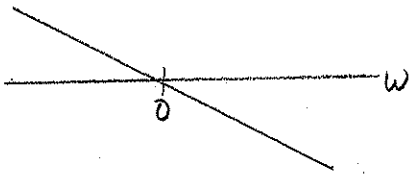
(9) $y(t) = x(t-2.5)$

5

a) 

b) $H^f(\omega) = e^{-j2.5\omega}$

c) $|H^f(\omega)| = 1$ 

d) $\angle H^f(\omega) = -2.5\omega$ 

e) $y(t) = 1 + 2\cos(\pi(t-2.5)) + 4\cos(3\pi(t-2.5))$

4

(10)

h	p/z
1	6
2	2
3	1
4	7
5	8
6	5
7	3
8	4

3

(11)

sys	output
1	3
2	4
3	6
4	1
5	5
6	2

#	points
1	2
2	2
3	3
4	3
5	4
6	6
7	5
8	3
9	5
10	4
11	3

40