Signals and Systems MATLAB HW3

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1.

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| (a) x[n] vs n |
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| (b) L=3 fc=0.05 近似到小數第二位 |
| (c) L=7 fc=0.05近似到小數第二位 |
| (d) L=3 fc=0.5近似到小數第二位 |
|  |
| (e)  Increasing L (b) vs (c)  (c)的|H|下降速度明顯比較快，相對於(b)是個更強的lowpass filter，第三張可以看出(c)的高頻的訊號被減弱了。而phase隨頻率的變化速度也稍微變快。  Increasing fc (b) vs (d)  比較第一張可以發現，(d)提高fc讓更多的頻率保留，time domian圖形(第三張)也更接近原來的input。而phase斜率變化相對平緩，不像(b)的有陡降。 |

2.

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| (a) x[n] vs n |
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| (b)  fc=0.2（cut off frequency ω= 0.2π），藉此濾掉ω=2\*π\*100\*0.002=0.4π以上的波，形成lowpass filter。 |
| |  |  |  |  | | --- | --- | --- | --- | | a0 | 1 | b0 | 5.8242E-10 | | a1 | -9.5922 | b1 | 9.3187E-09 | | a2 | 43.9955 | b2 | 6.9890E-08 | | a3 | -1.2779E+02 | b3 | 3.2616E-07 | | a4 | 2.6265E+02 | b4 | 1.0600E-06 | | a5 | -4.0445E+02 | b5 | 2.5440E-06 | | a6 | 4.8212E+02 | b6 | 4.6640E-06 | | a7 | -4.5335E+02 | b7 | 6.6629E-06 | | a8 | 3.3956E+02 | b8 | 7.4957E-06 | | a9 | -2.0310E+02 | b9 | 6.6629E-06 | | a10 | 96.6268 | b10 | 4.6640E-06 | | a11 | -36.1596 | b11 | 2.5440E-06 | | a12 | 10.4286 | b12 | 1.0600E-06 | | a13 | -2.2398 | b13 | 3.2616E-07 | | a14 | 0.3377 | b14 | 6.9890E-08 | | a15 | -0.0319 | b15 | 9.3187E-09 | | a16 | 0.0014 | b16 | 5.8242E-10 | |
| (c)  fc=[0.2, 0.8]（ω= 0.2π~0.8π的passband），藉此保留ω=2\*π\*100\*0.002=0.4π的波，形成bandpass filter，過濾掉原本低頻的波。 |
| |  |  |  |  | | --- | --- | --- | --- | | a0 | 1 | b0 | 8.7634E-04 | | a1 | -7.3275E-15 | b1 | 0 | | a2 | -3.1952 | b2 | -0.0140 | | a3 | 1.6875E-14 | b3 | 0 | | a4 | 6.7795 | b4 | 0.1052 | | a5 | 2.1361E-13 | b5 | 0 | | a6 | -9.8717 | b6 | -0.4907 | | a7 | 4.0821E-12 | b7 | 0 | | a8 | 11.2169 | b8 | 1.5949 | | a9 | 1.3714E-11 | b9 | 0 | | a10 | -10.0673 | b10 | -3.8278 | | a11 | 2.0322E-11 | b11 | 0 | | a12 | 7.3806 | b12 | 7.0177 | | a13 | 1.5656E-11 | b13 | 0 | | a14 | -4.4313 | b14 | -10.0253 | | a15 | 5.9317E-12 | b15 | 0 | | a16 | 2.1971 | b16 | 11.2784 | | a17 | 3.7204E-13 | b17 | 0 | | a18 | -0.8948 | b18 | -10.0253 | | a19 | -2.7628E-13 | b19 | 0 | | a20 | 0.2977 | b20 | 7.0177 | | a21 | -5.2014E-14 | b21 | 0 | | a22 | -0.0796 | b22 | -3.8278 | | a23 | 1.0408E-16 | b23 | 0 | | a24 | 0.0168 | b24 | 1.5949 | | a25 | 1.8865E-16 | b25 | 0 | | a26 | -0.0027 | b26 | -0.4907 | | a27 | 5.2259E-17 | b27 | 0 | | a28 | 3.0504E-04 | b28 | 0.1052 | | a29 | 5.7666E-18 | b29 | 0 | | a30 | -2.2120E-05 | b30 | -0.0140 | | a31 | -1.01241E-18 | b31 | 0 | | a32 | 7.6799E-07 | b32 | 8.7634E-04 | |