جامعة بيرزيت
BIRZEIT UNIVERSITY

Faculty of Engineering and Technology

Electric and Computer Engineering Department

Digital Signal Processing ENCS4310

19/20

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Quiz # 1 (A)

Date: Monday 11-10-2021 Duration: 25 minutes

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Question 1: Examine the system $y[n]=x[n]\cos(\omega_o n)$ with respect to the following properties:

a) Linear or nonlinear.

b) Time variant or time invariant.

c) Stable or unstable.

d) causal or noncausal.

e) Memory or memoryless.

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a) $\alpha_1 y_1 = \alpha_1 x[n]\cos(w_o n)$ ✓

$\alpha_2 y_2 = \alpha_2 x[n]\cos(w_o n)$ ✓

$\alpha_1 y_1 + \alpha_2 y_2 = \alpha_1 x[n]\cos(w_o n) + \alpha_2 x[n]\cos(w_o n)$ ✓

$\alpha_3 y_3 = \alpha_1 y_1 + \alpha_2 y_2$ $\quad \alpha_3 x_3 = \alpha_1 x_1 + \alpha_2 x_2$

$\alpha_3 y_3 = \alpha_3 x[n]\cos(w_o n)$

$\alpha_1 y_1 + \alpha_2 y_2 = (\alpha_1 x_1 + \alpha_2 x_2)\cos(w_o n)$ ✓ linear

b) $y(n-n_o) = x(n-n_o)\cos(w_o(n-n_o))$

$T[x[n-n_o]] = x(n-n_o)\cos(w_o n)$ ≠ ✓ time variant

c) $|y[n]| = |x[n]\cos(w_o n)| < \infty$

$= B_x \cos(w_o n) < \infty$ ✓

constant

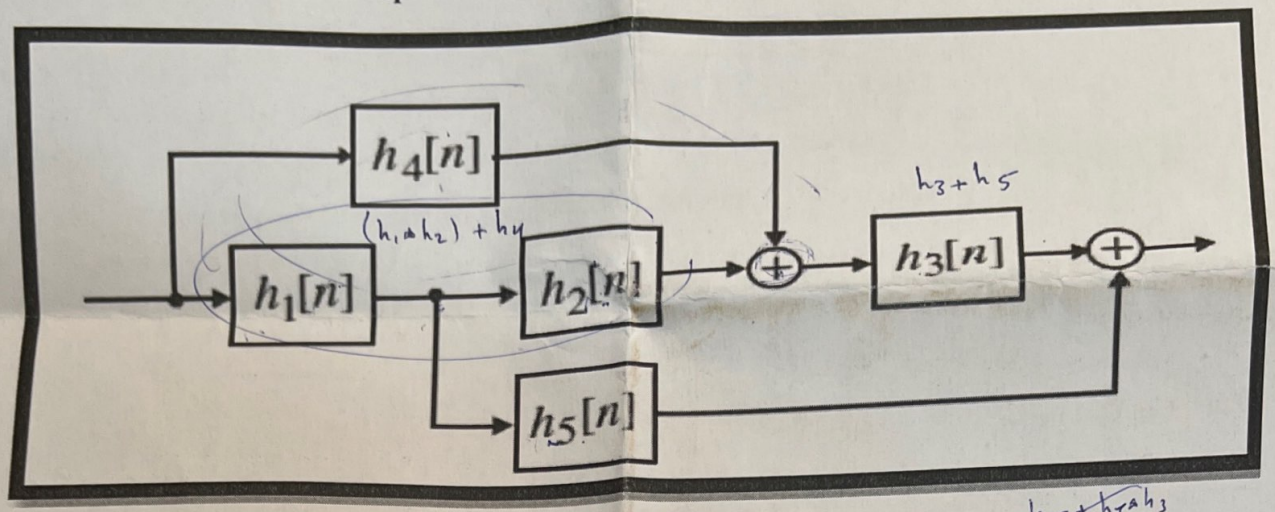
$x[n] \to BI \to$ stable

$y[n]$ stable if $\cos(w_o n) < \infty$

d) causal ✓ because output depend on ~~present~~ past or now value

e) ~~memory~~ memory less ✓ because system doesn't have ~~present~~ past value

Question 2: Determine the expression of the overall impulse response of the following system?



$h_6 = h_1 * h_2$

$h_7 = h_6 + h_4$

$h_8 = h_7 * h_3$

$h_9 = h_5 + h_8$

$h = h_9$

$h_5 + h_7 * h_3$

$h_5 + (h_6 + h_4) * h_3$

$h_5 + (h_1 * h_2) + h_4) * h_3$

$h[n] = h_5 + ((h_1 * h_2) + h_4) * h_3$

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b) Given that h[n]={1, 5, 2, 1, 4}, what is the output y[n] of the following input x[n]={1, 3, 2, 1, 2}?

x[n] / h[n]	1	3	2	1	2
1	1	3	2	1	2
5	5	15	10	5	10
2	2	6	4	2	4
1	1	3	2	1	2
4	4	12	8	4	8

$y[n] = \{1, 8, 19, 18, 18, 26, 13, 6, 8\}$

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