Exame Época Normal 2017

⑤ $X_{FT}(\omega) = \begin{cases} 0, & \omega < -12\pi \vee \omega > 12\pi \\ \frac{(\omega+8\pi)(\omega-8\pi)}{4\pi^2}, & -12\pi \leq \omega \leq 12\pi \end{cases}$

a) $X_{DTFT}[10\pi] = 180 \quad X_{FT}(10\pi) = \frac{18\pi \times 2\pi}{4\pi^2} = \frac{36\pi^2}{4\pi^2} = 9$

$f_s = ? \qquad f_1 = \frac{180}{9} = 20\,Hz$ //

$T_0 = N \times T_s = 1$

b) $f_1 = 40\,Hz \quad \Omega_0 = \frac{\pi}{20}\,rad \quad T_s = \frac{1}{40} \quad N = \frac{2\pi}{\frac{\pi}{20}} = 40$

$c_5 = \frac{1}{1} X_{FT}(10\pi) = 9 \qquad C_5 = 2|c_5| = 18$

c) Passa baixo.

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⑥ $f_s = 4000\,Hz \quad Ré(294Hz) \quad Mi(330Hz)$

a)

294	2
147	3
49	7
7	7
1	

330	2
165	3
55	5
11	11
1	

$294 = 2 \times 3 \times 7^2$

$330 = 2 \times 3 \times 5 \times 11$

$mdc = 6\,Hz$

$\Delta f = 6\,Hz$

R: 1/6 ✓

b) $t_{janela} = 0{,}25\,s$ $\Delta f = 2\,Hz$ // ← target

$$\Delta f = \frac{f_1}{N} = \frac{4000}{N}$$

$$N = t_{janela} \times f_1$$
$$= 0{,}25 \times 4000$$
$$= 1000$$

$$\Rightarrow \frac{4000}{(1000+x)} = 2$$

$$\Leftrightarrow 4000 = 2000 + 2x$$

R: Padding com 1000 zeros.

$$\Leftrightarrow x = 1000$$

(7)

0 - 125 - 250

$f_s = 2000\,Hz$

$$\left[0, \frac{2000}{2^3}\right] = [0, 250]$$

	0-499	500 - 999	1000-1499	
d_3	$f \in [125, 250]$ $C = 3$		$f \in [125, 250]$ $C = 2$	
R_3	$f = 0, C = 2$ $f = 16Hz, C = 1$	$f = 12Hz$ $C = 2$	$f = 0\,Hz$ $C = 2$	$f = 0\,Hz, C = 2$