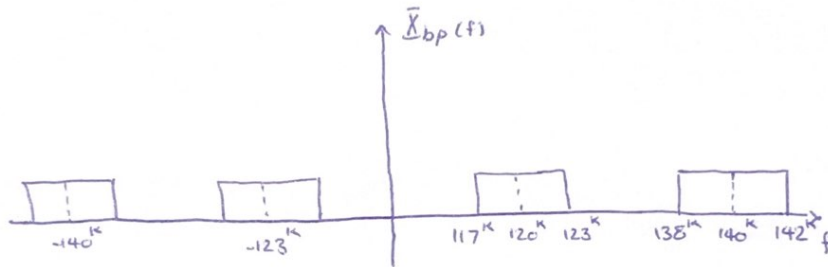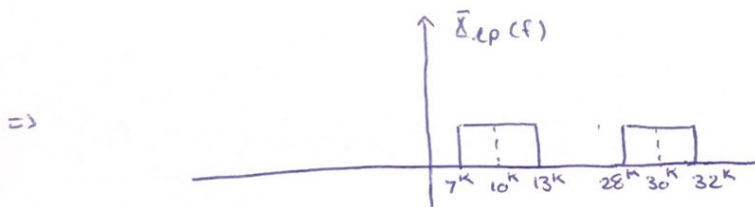اسما چینی
امتحان کتاب دوم مخابرات
۹۸۱۲۳۲۰۶

$\bar{X}_{bp}(f) = \Pi\left(\dfrac{f \pm 120^k}{6000}\right) + \Pi\left(\dfrac{f \pm 140}{4000}\right)$

$f_c = 110^{KHZ}$

$\bar{X}_{lp}(f) = \bar{X}_{bp}(f+f_c)\, u(f+f_c) = \bar{X}_{bp}(f+110^{KHZ})\, u(f+110^k)$

$\Rightarrow$

$\bar{X}_{lp}(f) = \Pi\left(\dfrac{f-10^k}{6^k}\right) + \Pi\left(\dfrac{f-30^k}{4^k}\right) \xrightarrow{\mathcal{F}^{-1}} x_{lp}(t) = 6^k \operatorname{sinc}(6^k t)\, e^{j2\pi 10^k t} + \cdots$

$+ 4^k \operatorname{sinc}(4^k t)\, e^{j2\pi 30^k t}$ $e^{j\theta} = \cos\theta + j\sin\theta$

$= 6^k \operatorname{sinc}(6^k t) \cdot \left[\cos(2\pi 10 t) + j\sin(2\pi 10 t)\right] + 4^k \operatorname{sinc}(4^k t) \cdot \left[\cos(2\pi 30 t) + j\sin(2\pi 30 t)\right]$

$= 6^k \operatorname{sinc}(6^k t) \cdot \cos(20\pi t) + 4^k \operatorname{sinc}(4^k t) \cdot \cos(60\pi t) + j\left[6^k \operatorname{sinc}(6^k t) \cdot \sin(20\pi t)\right.$

$\left. + 4^k \operatorname{sinc}(4^k t) \cdot \sin(60\pi t)\right]$ $\dfrac{\otimes\, x_{lp}(t) = \frac{1}{2}\left(x_i(t) + j x_q(t)\right)}{}$

$\begin{cases} x_i(t) = 2\operatorname{Re}\{x_{lp}(t)\} = 12^k \operatorname{sinc}(6^k t) \cdot \cos(20\pi t) + 8^k \operatorname{sinc}(4^k t) \cdot \cos(60\pi t) \\[2mm] x_q(t) = 2\operatorname{Im}\{x_{lp}(t)\} = 12^k \operatorname{sinc}(6^k t) \cdot \sin(20\pi t) + 8\operatorname{sinc}(4^k t) \cdot \sin(60\pi t) \end{cases}$

$\Rightarrow x(t) = 2\operatorname{Re}\left\{x_{lp}(t)\, e^{j2\pi 110^k t}\right\}$