

$$1) X(f) = T \sum_{k=0}^{+\infty} (0.1)^k e^{-j2\pi k f T} + T \sum_{k=0}^{+\infty} (0.1)^k e^{+j2\pi k f T} - T$$

$$= T \sum_{k=-\infty}^{+\infty} 0.1^{|k|} e^{-j2\pi k f T}$$

$$x(kT) = 0.1^{|k|}$$

$$E_x = T \sum_{k=-\infty}^{+\infty} 0.1^{|k|} = T \left( 2 \sum_{k=0}^{+\infty} 0.1^k - 1 \right) = \frac{2T}{1-0.01} - T$$

$$2) H(f) = h_0 \frac{T}{h} \text{triangle} \left( \frac{fT}{h} \right)$$

$$y(t) = |H(f_0)| \cos \left( 2\pi f_0 t + \frac{\pi}{h} + \angle H(f_0) \right) \quad f_0 = \frac{1}{T}$$

$$= \frac{3}{16} h_0 T \cos \left( 2\pi \frac{t}{T} + \frac{\pi}{h} \right)$$

$$3) \frac{x(t)}{R} \begin{array}{|c|} \hline \downarrow \\ \hline \end{array} Z(T) \begin{array}{|c|} \hline \uparrow \\ \hline \end{array} R \begin{array}{|c|} \hline \frac{1}{T} \text{rect} \left( \frac{f}{T} \right) \\ \hline \end{array} \frac{\hat{x}(t)}{R}$$

$$\hat{X}(f) = 2\pi c f T \cdot \left( \sum_{k=-\infty}^{+\infty} V_0 T_1 \text{triangle} \left( (f - \frac{k}{T}) T_1 \right) \right)$$

$$4) x(t) = e^{-\pi \left( \frac{t}{\sqrt{\pi} t_0} \right)^2} \quad y(t) = e^{-\pi \left( \frac{2t}{\sqrt{\pi} t_0} \right)^2}$$

$$Z(f) = X(f) Y(f) = \sqrt{\pi} t_0 e^{-\pi (f \sqrt{\pi} t_0)^2} \cdot \sqrt{\pi} t_0 e^{-\pi \left( \frac{f \sqrt{\pi} t_0}{2} \right)^2}$$

$$= \frac{\pi t_0^2}{2} e^{-\pi \left( \frac{\sqrt{5}}{2} \sqrt{\pi} f t_0 \right)^2}$$

$$z(t) = \frac{\pi t_0^2}{2} \frac{2}{\sqrt{5} \sqrt{\pi} t_0} \cdot e^{-\pi \left( \frac{2}{\sqrt{5}} \frac{t}{\sqrt{\pi} t_0} \right)^2}$$

$$5) 2\pi c^2 \left( \frac{4(t+0.2T)}{T} \right) \text{ la bande } \frac{4}{T}$$

$$2\pi c^2 \left( \frac{4(t+0.2i)}{T} \right) \cos \frac{4\pi t}{T} \text{ la bande } \frac{6}{T}$$

$$2\pi c^3 \left( \frac{4t}{T} \right) \text{ la bande } \frac{6}{T} \text{ (conv. 3 rect ou bande } \frac{2}{T} \text{)}$$

la somme la bande  $\frac{6}{T} \Rightarrow F_{\text{max}} = \frac{12}{T}$ .