(2) Derive formula for b.w. of $P(s)$ in terms of a, b, T

$$\frac{\|P(j\omega)\|}{\|P(0)\|} = \frac{1}{\sqrt{2}} \Rightarrow \left\| \frac{bT}{j\omega + aT} \right\| \cdot \frac{a}{b} = \frac{1}{\sqrt{2}}$$

$$\Rightarrow \frac{bT}{\sqrt{a^2T^2+\omega^2}} \cdot \frac{a}{b} = \frac{1}{\sqrt{2}}$$

$$\Rightarrow a^2T^2 + \omega^2 = 2a^2T^2$$

$$\Rightarrow \omega^2 = 2a^2T^2 - a^2T^2 = a^2T^2$$

$$\Rightarrow \boxed{\omega = aT}$$