

5a) collecting 4096 samples in 1s means that the sampling frequency is  $f_s = 4096 \text{ Hz}$ .

If  $x_a(t)$  is to be sampled without aliasing, the sampling frequency must be twice the highest frequency in  $x_a(t)$ .

Therefore,  $x_a(t)$  should have no frequencies above  $f_0 = 2048 \text{ Hz}$ .

5b) With 4096-point, we are sampling  $X(e^{j\omega})$  at 4096 equally spaced frequencies between 0 and  $2\pi$ , which corresponds to 4096 frequency samples over the range  $0 \leq f \leq 4096 \text{ Hz}$ . Therefore, the frequency spacing is  $\Delta f = 1 \text{ Hz}$ .