# Data sampling and reconstruction

**Requirements**

1. The report should be written in English.
2. Include your student number in each figure title as ‘No. XXXXXXX’. And include your codes in the appendix with the question numbers.
3. Please submit your report in PDF format.

## Signal operations

A continuous-time (CT) signal *x*(*t*) includes three gate functions can be represented as , the center gate function *g*0(*t*) is defined as

 ,

and the two neighboring gate functions can be considered as a shift of *g*0(*t*), i.e. and . The parameters of the gate function are shown in Table 1.

a) Please plot the CT signal  with proper parameters.

Table 1 Parameters of the gate function

|  |  |  |  |
| --- | --- | --- | --- |
| Parameters | *A* | *B* | *D* |
| Values | 3 | 4 | 8 |

## Aliasing phenomenon in sampling process

A continuous time signal x(t) can be expressed as the summation of two harmonics：



both frequencies of the harmonics are in a narrow frequency band, i.e. from 800 Hz to 850 Hz. Sample with a sampling rate and give the samples as . Calculate the parameters of the two harmonics and fill in Table 1. Assume that the integral scale is from to s while doing CTFT.



|  |  |  |
| --- | --- | --- |
| Parameters |  |  |
|  |  |  |
|  |  |  |