

# Science and Technology English I

## Exercise 112 Meiji University 2020

(DICS Chapter-3 , Ring Oscillator)

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<http://mikami.a.la9.jp/mdc/mdc1.htm>

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## EX\_112-2 P116-117 [STE-101-308~9]

- 3.2.3 Performance: The Dynamic Behavior
- The propagation delay  $t_p$  of a gate defines how quickly it responds to a change at its input and relates directly to the speed and performance metrics. The propagation delay expresses the delay experienced by a signal when passing through a gate. It is measured
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- between the 50% transition points of the input and output waveforms; as shown in Figure 3.10 for an inverting gate. Because a gate displays different response times for rising or falling input waveforms, two definitions of the propagation delay are necessary. The  $t_{pLH}$  defines the response time of the gate for a low to high (or positive) output transition, while  $t_{pHL}$  refers to a high to low (or negative) transition. The overall propagation delay  $t$  is defined as the average of the two,
- Knowledge of  $t_p$  is, however, not sufficient to completely characterize circuit performance. The power consumption, noise behavior, and, indirectly, the speed of a gate are also strong functions of the signal slopes (as will become clear later in this chapter). This can be quantified with the rise and fall time measures  $t_r$  and  $t_f$ , which are defined between the 10% and 90% points of the waveforms (Figure 3.10).





