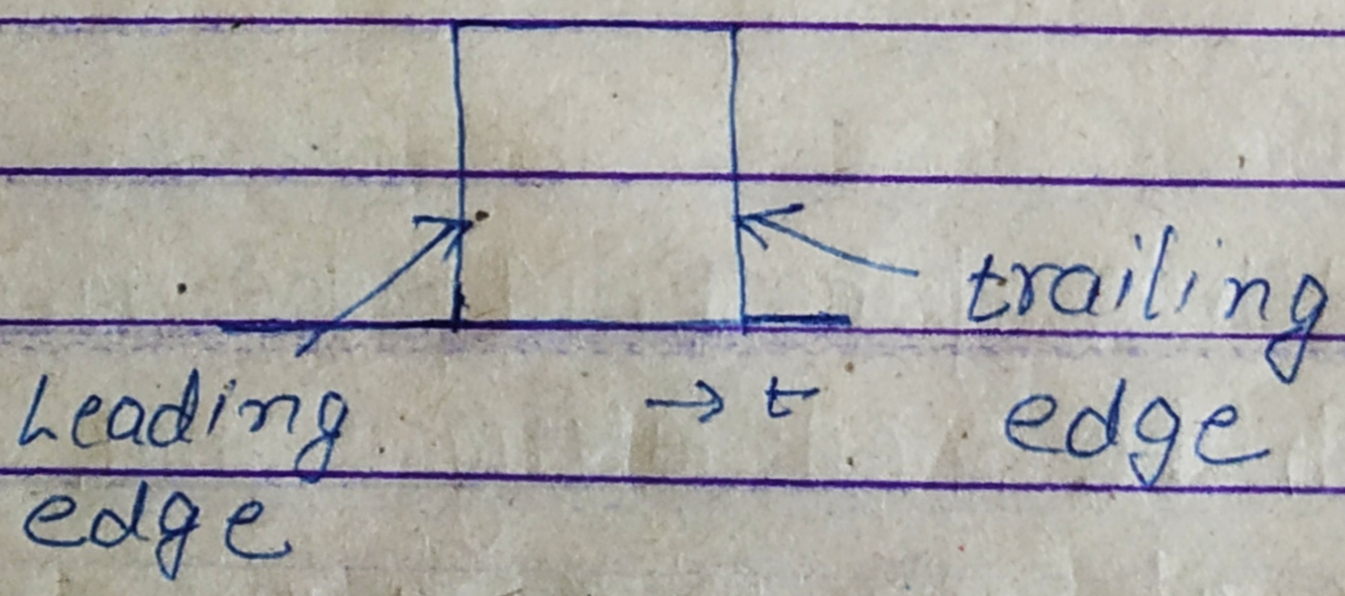
Pulse Width Modulation

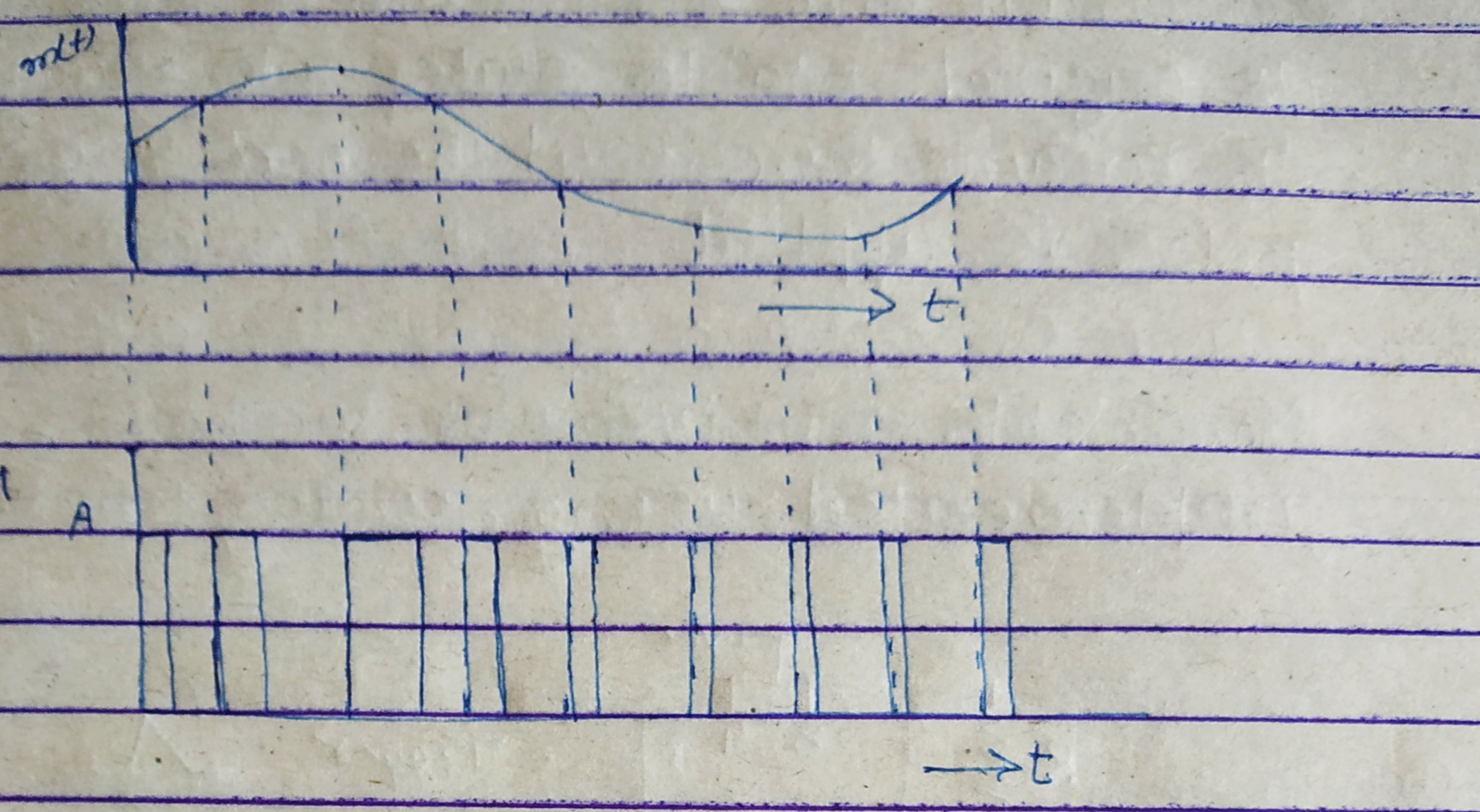
It is also known as pulse duration modulation (PDM). ~~The~~ In this scheme of pulse modulation amplitude of pulse is held constant, whereas width of pulse is made proportional to the amplitude of signal at the sampling instant.

There are three variations of pulse width modulation are possible. In one variation, the leading edge of the pulse is held constant and change in pulse width with signal is measured with respect to the leading edge.



In other variation, the trailing edge is held constant and with respect to it pulse width is measured. In third variation, Centre of the pulse is held constant And pulse width Changes on either side of the centre of pulse.

Pulse Width Modulation waveform



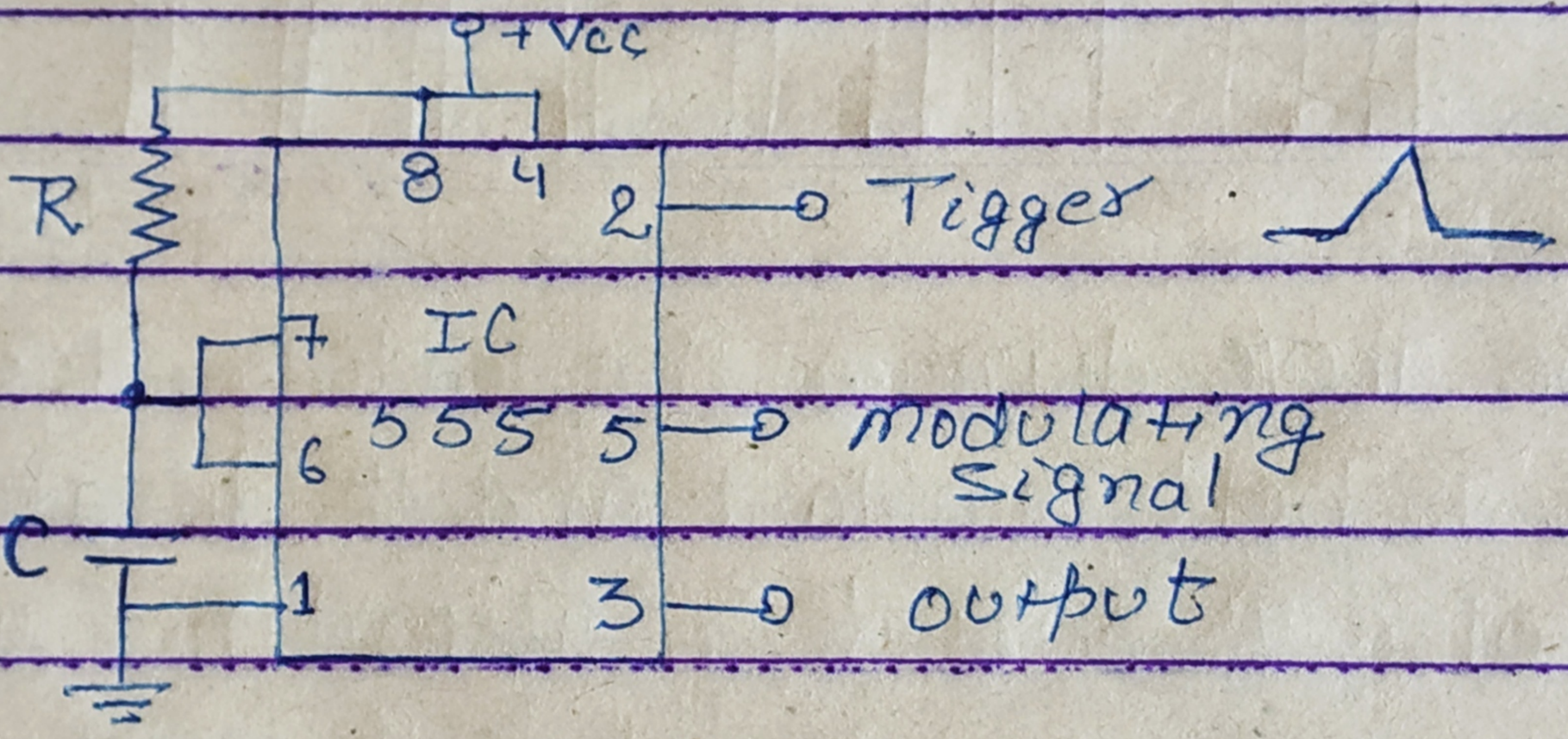
In the above diagram, the leading edge of pulse is held constant and the duration of pulse is varied in accordance with the instantaneous value of message signal m(t).

Generation of Pulse Width Modulation

Pulse width Modulation waveform is generated using MonoStable multivibrator. MonoStable multivibrator has one stable state and one quasi ~~state~~ Stable state. It remains in its Stable State until an input pulse trigger it into its quasi stable state for a time duration determined by discharging an

RC circuit and the circuit returns to its original stable state automatically. It remains there until the next trigger pulse is applied.

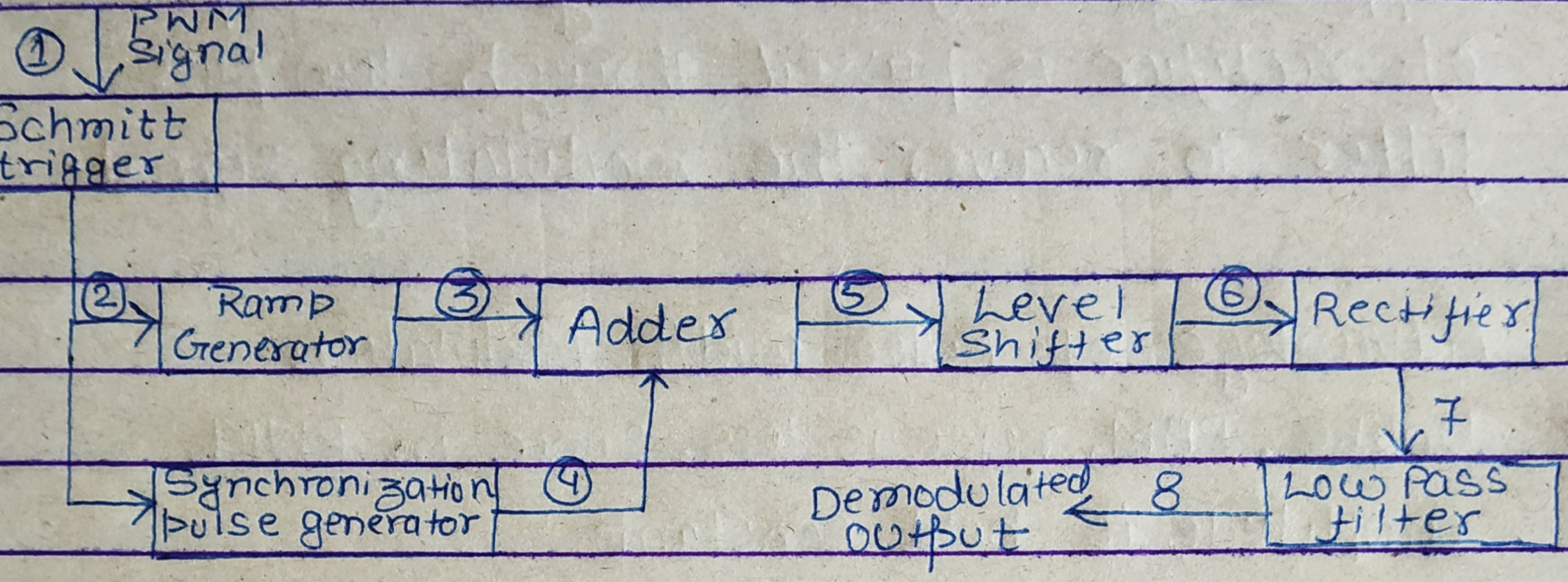
Monostable multivibrator can be implemented using IC 555 timer.



In monostable multivibrator, modulating input signal is applied at the control voltage input. Internally, the control voltage is adjusted to 2/3 Vcc. Externally applied modulating signal changes the control voltage and, hence the threshold voltage level. As a result, the time period required to charge the capacitor up to threshold voltage level changes, giving pulse modulated signal at the output.

Demodulation of Pulse Width Modulation Signal

The block diagram of ~~pulse~~ demodulation of pulse width Modulation signal is given below



The received PWM Signal is applied to the Schmitt trigger circuit. This Schmitt trigger circuit removes the noise in the PWM waveform. The regenerated PWM is then applied to the ramp generator and the synchronization pulse detector. The ramp generator produces ramp for the duration of pulses such that height of ramps are proportional to the width of PWM pulses. The maximum ramp voltage is retained till the next pulse. On the other hand, Synchronous pulse detector produces reference pulse with constant amplitude and pulse width. These pulse are delayed by specific amount of delay. The delayed

reference pulses and the output of ramp generator is added with the help of adder. The output of adder is given to the level shifter. Then the negative part of the waveform is clipped by rectifier. Finally, the output of rectifier is passed through low pass filter to recover the modulating signal.

Advantage of Pulse width Modulation

① Unlike, PAM, noise is less, since in PWM, amplitude is held constant.

② Signal and noise seperation is very easy

③ PWM communication does not require Synchronization between transmitter and receiver

Disadvantage of Pulse Width Modulation

① In PWM, pulses are varying in the width & therefore their power contents are variable. This requires that the transmitter must be able to handle the power content of the pulse having maximum pulse width.

② Large bandwidth required in Comparison to PAM.