

# CLOCK WAVE GENERATOR USING OP-AMP FOR DIGITAL COUNTER CIRCUITS

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## Abstract:

Clock pulses can be generated using operational amplifier. These clock pulses are given as input for digital counter circuits. This circuit is composed of op-amp, resistors, capacitor, ADC bridge, a counter and the power supply. The circuit is a mixed signal circuit design which consists of both analog and digital part. Analog part is designed as a circuit and the digital part is written in Verilog IP codes.

**Keywords:** OP-Amp, ADC, Analog, Digital.

## Clock wave generator using Op-Amp:

The circuit is designed using SKY130 components (fig.1.1). An operational amplifier (op-amp) is an integrated circuit (IC) that amplifies the difference in voltage between two inputs. For the digital counter circuit, the input signal clock pulse which is passed through the ADC bridge. A digital counter is obtained by arranging the flip-flops. It is shown in the (fig 1.2). These are the applications of flip-flops. These are used for measuring the frequency as well as time. These are used to increase the addresses in memory. The operation of these devices depends on the single clock applied. The analog output signal is given as the input for digital counter. This shown in the fig (1.3). Thus, the counter gives digital output (fig 1.4).

## Circuit Diagram:

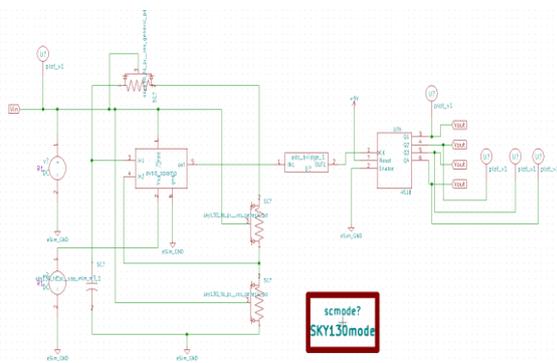


Fig.1.1 Schematic diagram of clock wave generator using op-amp for digital counter.

## Generated Square wave from Op-Amp (Analog output):

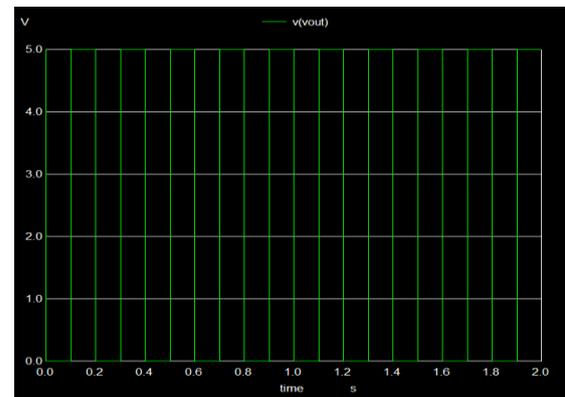
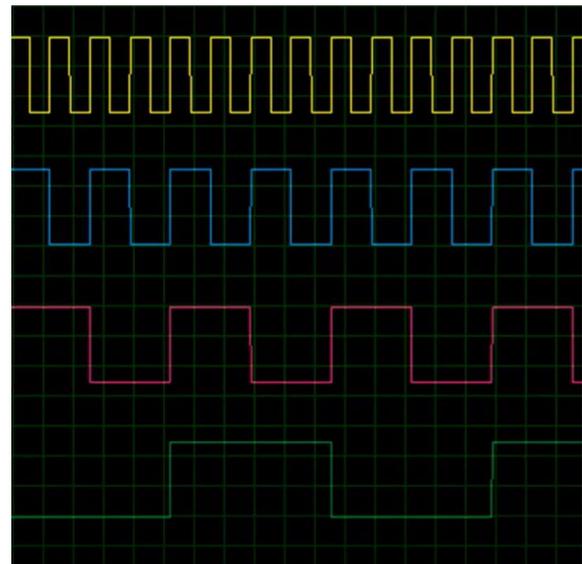


Fig.1.2 Waveform generated from op-amp using NGSpice in e-sim.

## Output Waveform:



## References:

1. How to use e-sim software?  
<https://www.youtube.com/watch?v=vKFwq6TGaVg&t=606s>
2. Sample circuit of inverter circuit.  
<https://www.youtube.com/watch?v=S4NJqYjBcXg>