

## clock\_4.gce

### Attributes

```
mainvars: y1 y2 y3 y4
rparms: tperiod=0.02  g_high=1.0
+      dt1=0.01  dt2=0.01  alpha=10  beta=0
```

### Description

`clock_4.gce` generates a set of four clock signals `y1`, `y2`, `y3`, `y4`. The four signals are related in a specific manner as will be illustrated in the following examples. The parameters have the following meaning:

**tperiod:** Period.

**g\_high:** The amplitude of each of the four signals. The signals vary from 0 to `g_high`.

**dt1:** Width of the rising edges.

**dt2:** Width of the falling edges.

**alpha:** Angle (in degrees) which determines the duty cycle of the four signals. For example, if `alpha=20°`, then `y1` will be high for  $2 \times (90 - 20) = 140^\circ$  and low for the remaining time.

(One period corresponds to  $360^\circ$ .)

**beta:** An “offset” angle (in degrees) with respect to  $t = 0$ .

Note that the rising and falling edge widths are included in  $T_1$  or  $T_2$ , the high and low intervals.

AC behaviour is not implemented.

The effect of the various parameters of `clock_4.gce` on the waveforms is shown in Figs. 1 and 2. The corresponding circuit file is given below.

```

title: testing of clock_4.gce

begin_circuit
    gelement type=clock_4
+   y1=y1 y2=y2 y3=y3 y4=y4
+   g_high=1 tperiod=1 dt1=0.01 dt2=0.01
+   alpha=20 beta=0
    gelement type=clock_4
+   y1=y5 y2=y6 y3=y7 y4=y8
+   g_high=1 tperiod=1 dt1=0.01 dt2=0.01
+   alpha=20 beta=120
    outvar:
+   y1=var_of_y1
+   y2=var_of_y2
+   y3=var_of_y3
+   y4=var_of_y4
+   y5=var_of_y5
+   y6=var_of_y6
+   y7=var_of_y7
+   y8=var_of_y8
end_circuit

begin_solve
    solve_type=dc
    initial_sol initialize
end_solve

begin_solve
    solve_type=trns
    initial_sol previous
    begin_output
        filename=clock_4_gce_1.dat
        variables: y1 y2 y3 y4
    end_output
    begin_output
        filename=clock_4_gce_2.dat
        variables: y5 y6 y7 y8
    end_output
    method: back_euler=yes
+   t_start=0 t_end=3.0 delt_const=0.1
+   delt_min=0.001
end_solve

end_cf

```

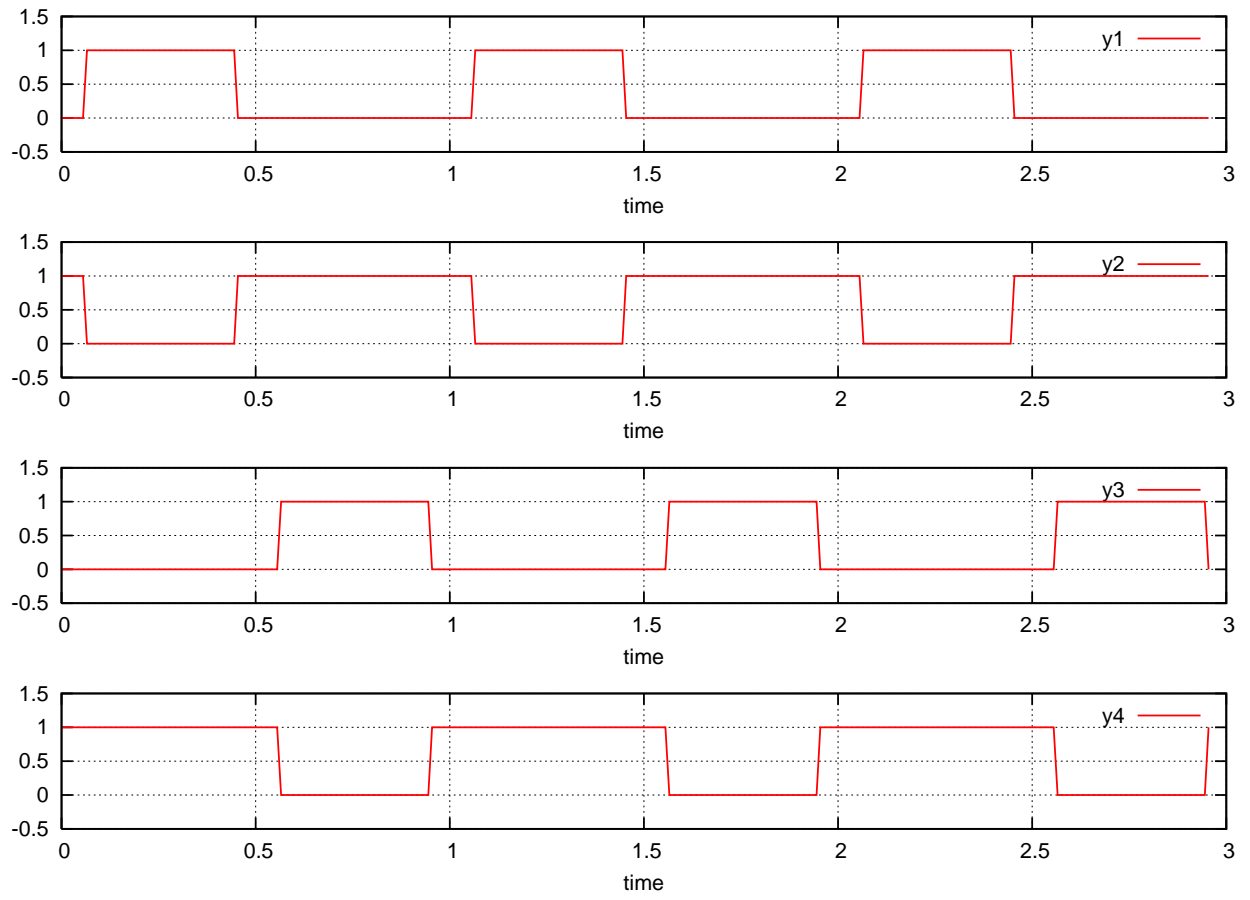


Figure 1: Waveforms obtained with `clock_4.gce` with `g_high=1`, `tperiod=1`, `dt1=0.01`, `dt2=0.01`, `alpha=20`, `beta=0`.

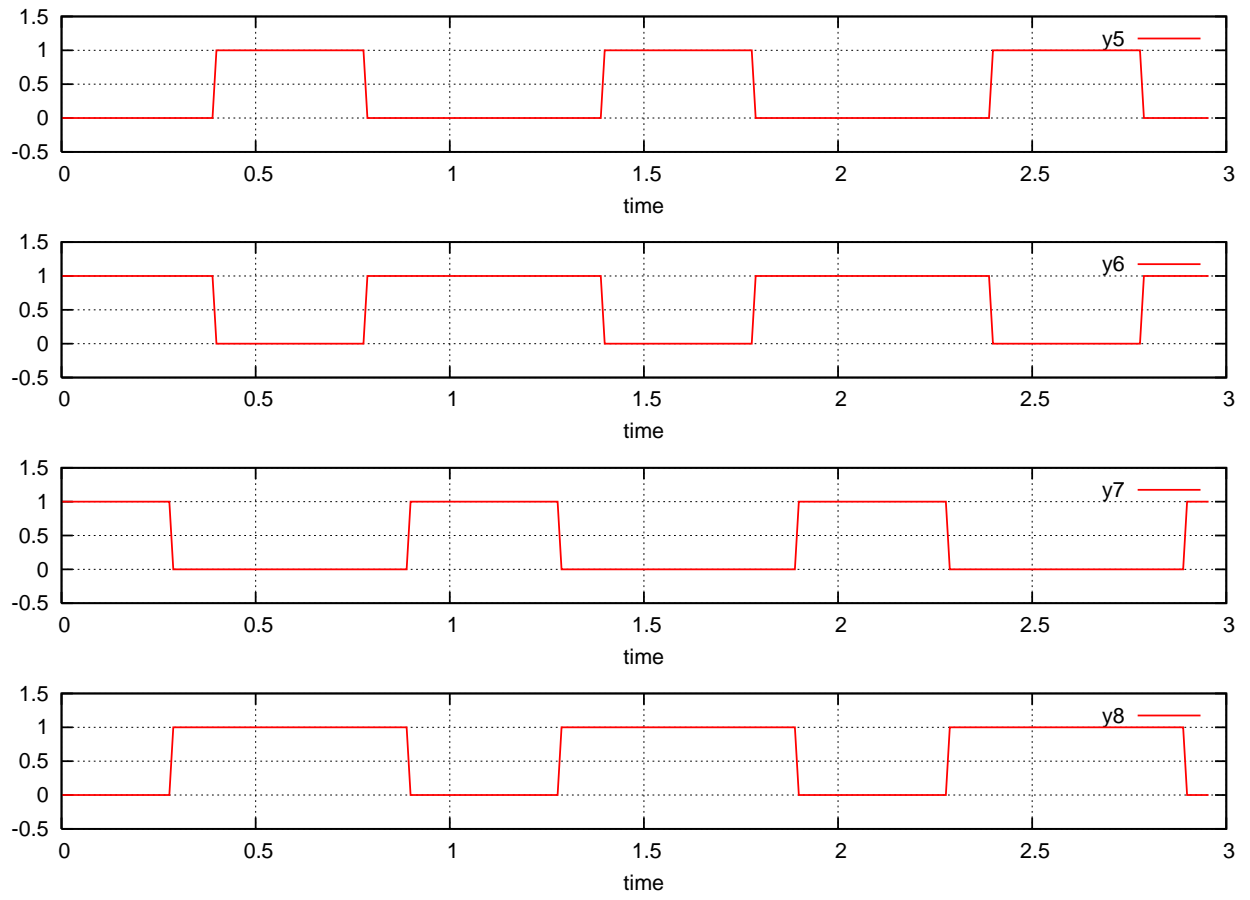


Figure 2: Waveforms obtained with `clock_4.gce` with `g_high=1`, `tperiod=1`, `dt1=0.01`, `dt2=0.01`, `alpha=20`, `beta=120`.