Pulse Width Modulation Based on FPGA

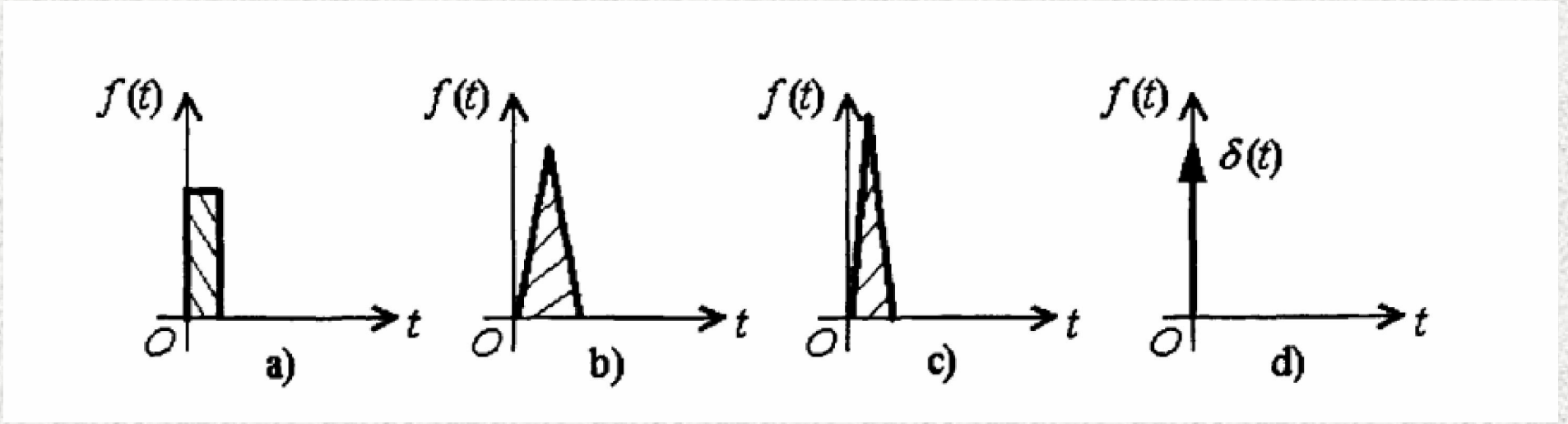
ECE641 Term Project

Instructor: Mustafa U. Torun

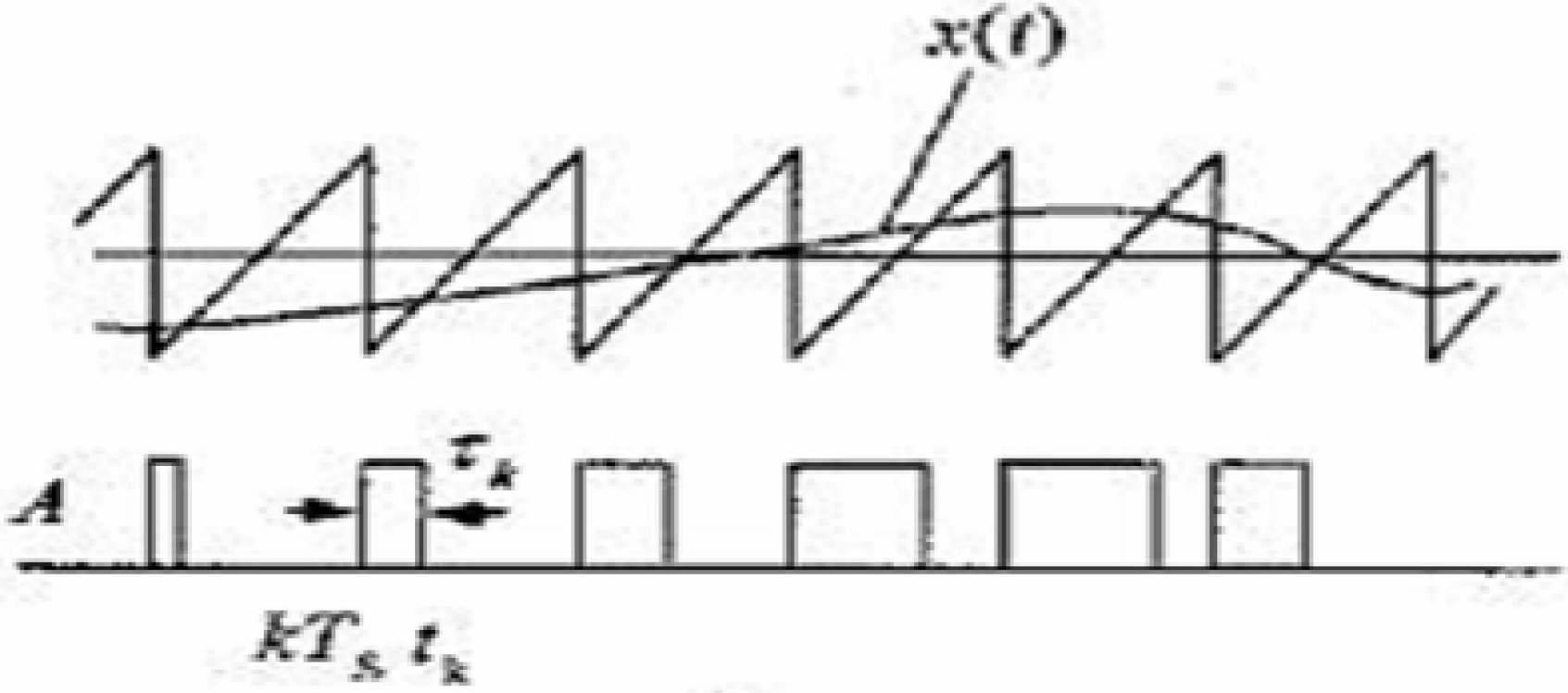
Xiao Wang

31236946

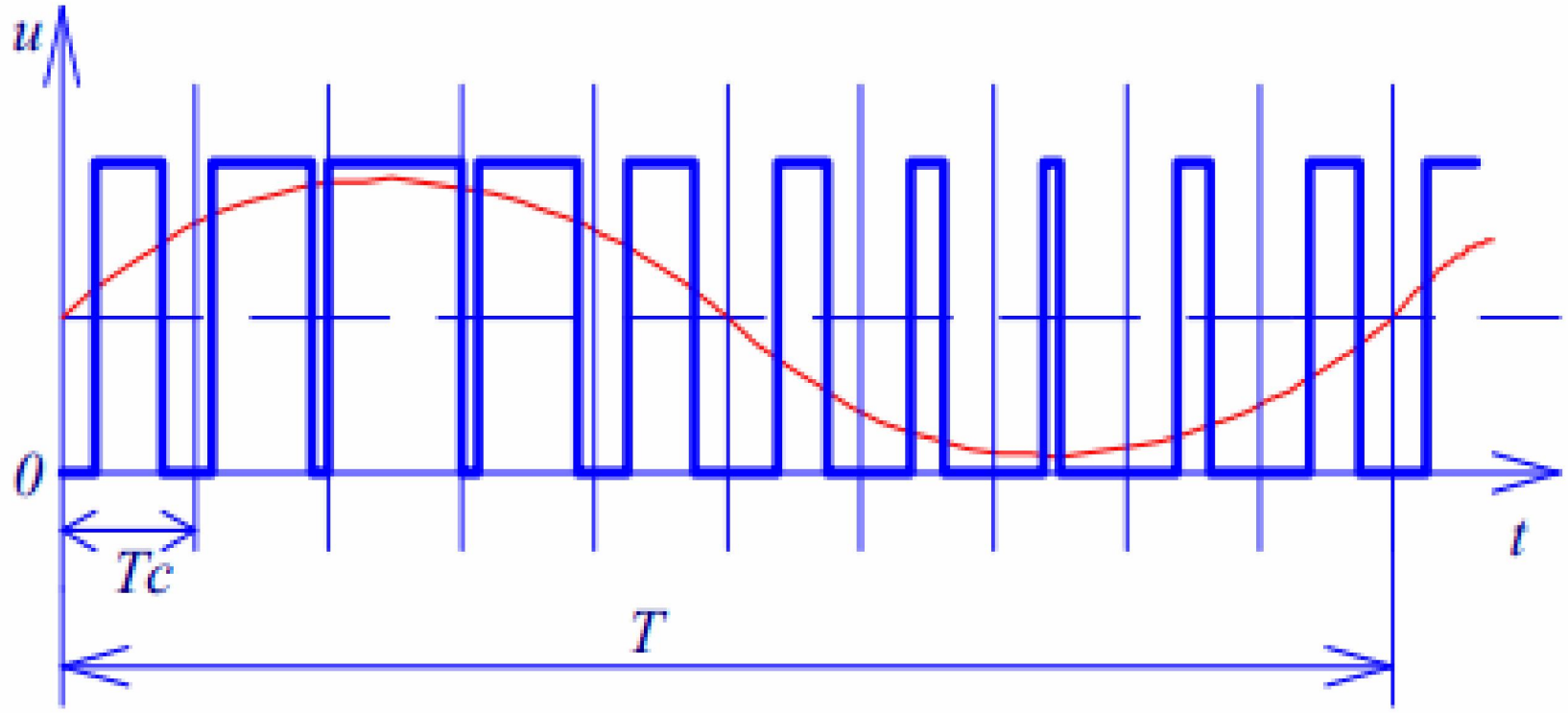
Area Equivalent Principle



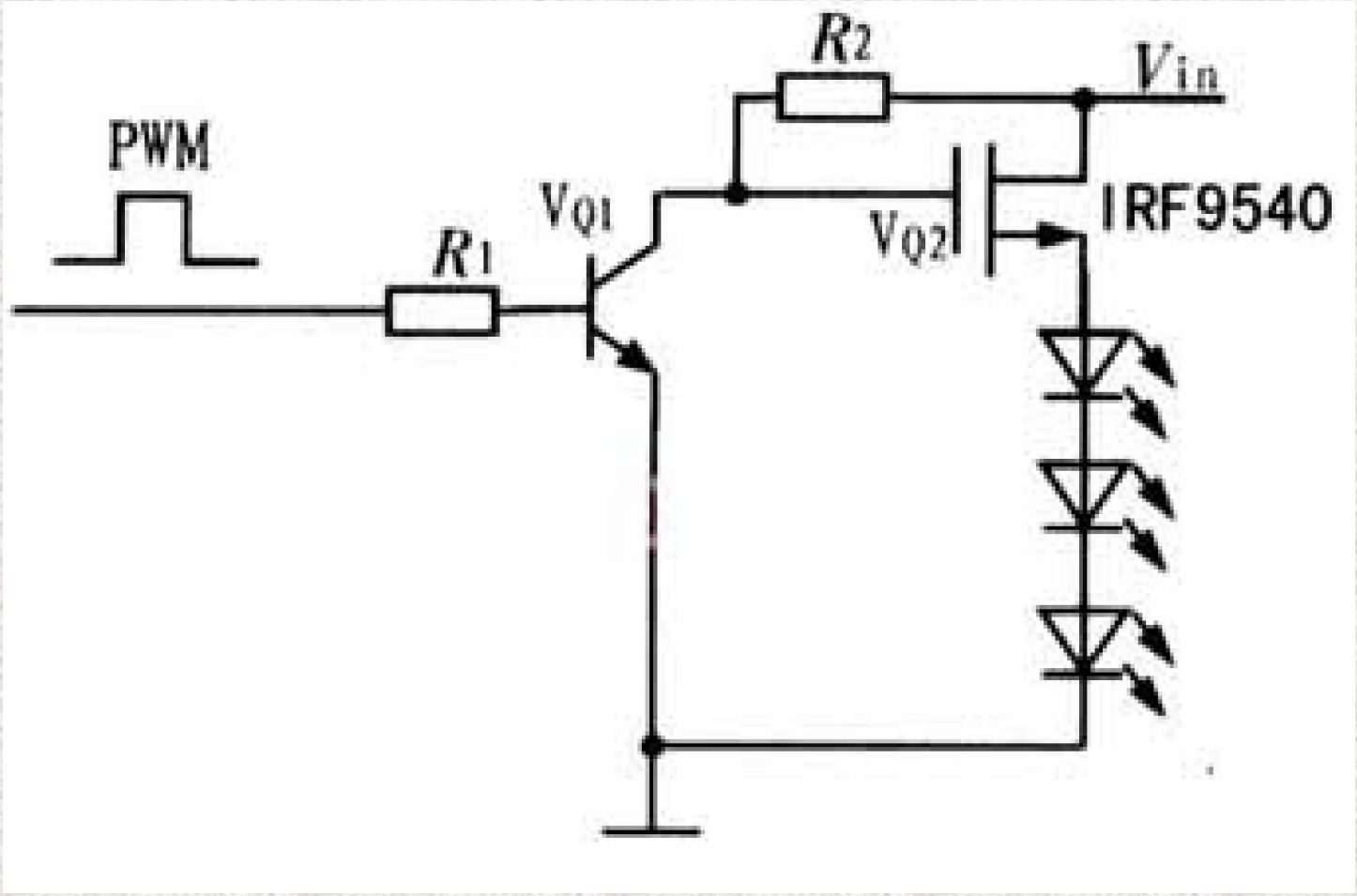
How to sample?



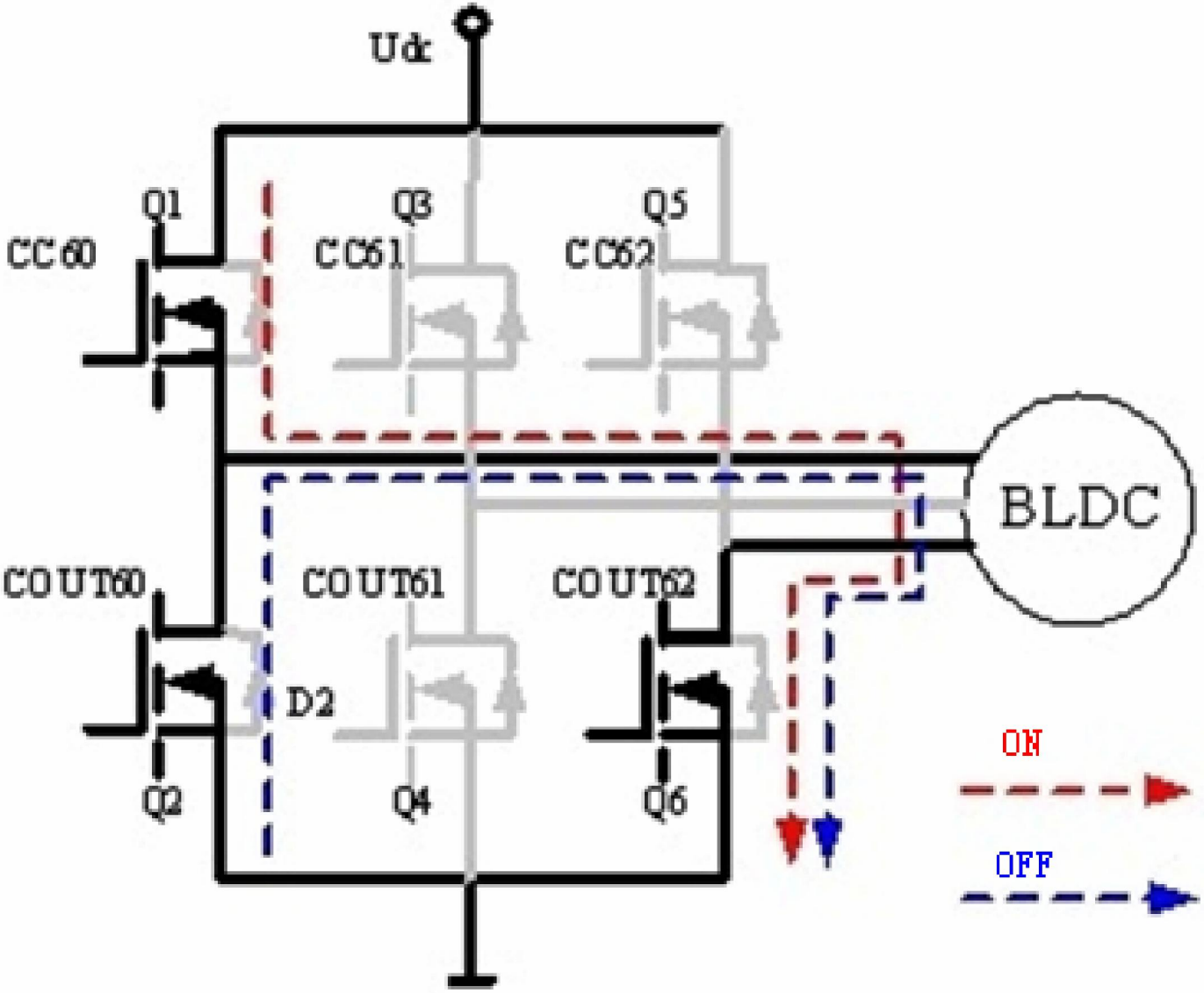
SPWM



Engineering Application



Engineering Application



Matlab File

get_samples_mif.m

```
depth=32;                       %depth of the data;
widths=8;                        %width of the data;
N=0:1: 256;
s=sin(pi*N/16);                 %compute the value of Sin(0 to pi)/2;
fidc=fopen('d:\samples.mif','wt');       %open as "wt", \n is enter
% write samples.mif %
fprintf(fidc,'depth=%d;\n',depth);
fprintf(fidc,'width=%d;\n',widths);
fprintf(fidc,'address_radix=uns;\n');
fprintf(fidc,'data_radix = uns;\n');
fprintf(fidc,'Content Begin\n');
for(x=1:depth)
fprintf(fidc,'%d:%d;\n',x-1, round(127*sin(pi*(x-1)/ 16)+128));

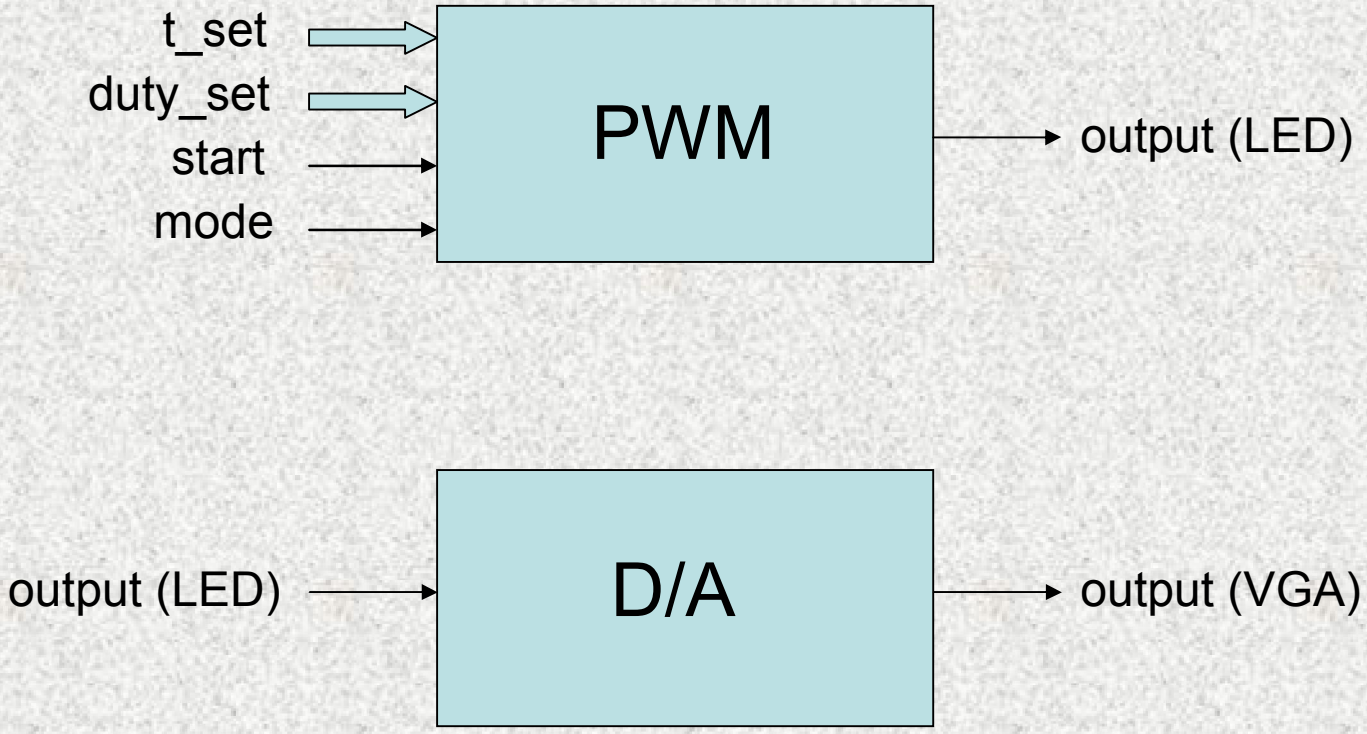
end
fprintf(fidc,'end;');
fclose(fidc);

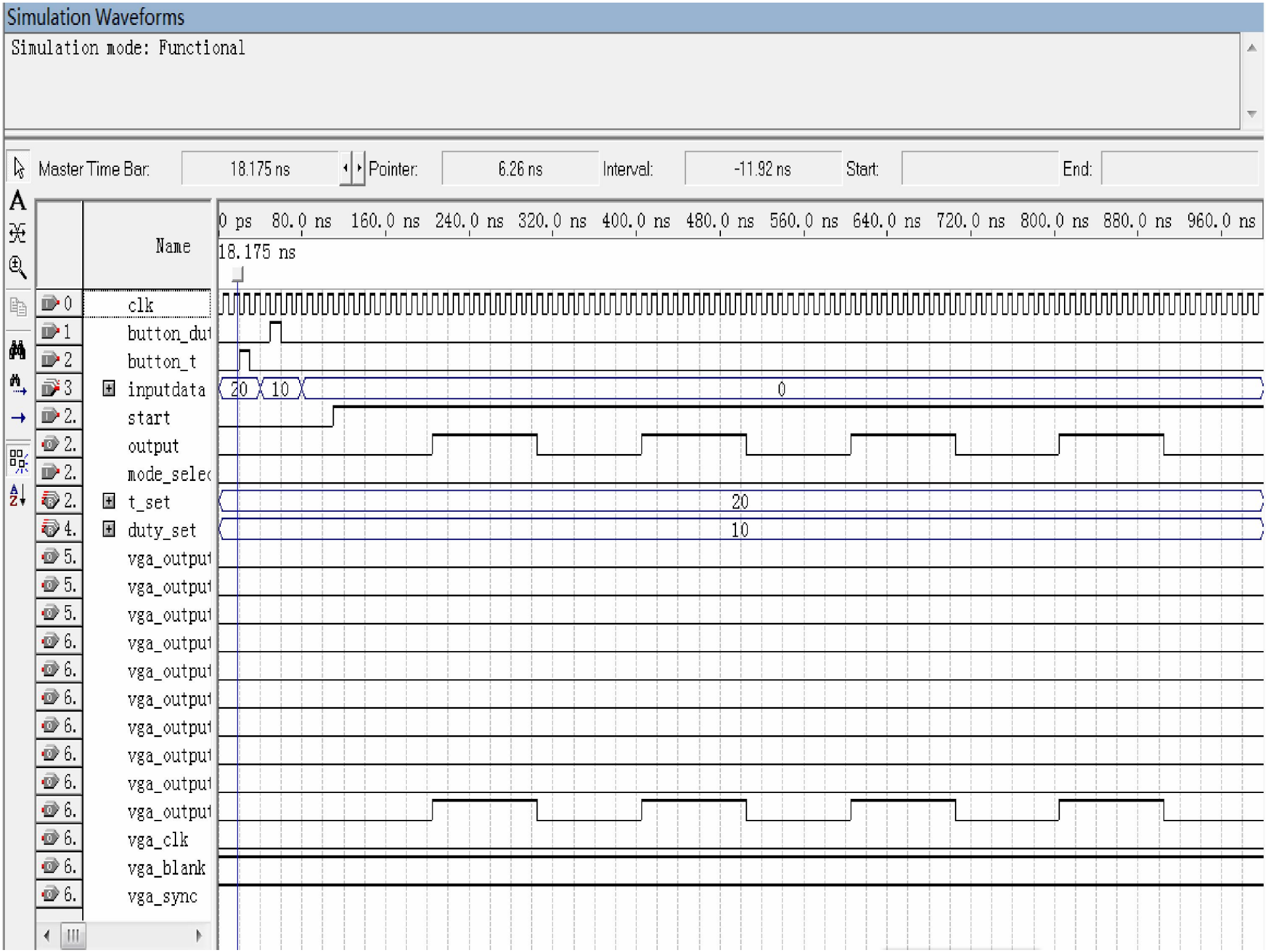
```

Generated MIF File

```
depth=32;
width=8;
address_radix=uns;
data_radix = uns;
Content Begin
0:128;
1:153;
2:177;
3:199;
4:218;
5:234;
6:245;
7:253;
8:255;
9:253;
10:245;
11:234;
12:218;
13:199;
14:177;
15:153;
16:128;
```

Block Diagram




Simulation Waveforms
Simulation mode: Functional
Master Time Bar: 18.175 ns
Pointer: 6.26 ns
Interval: -11.92 ns
Start:
End:
Name
0 ps 80.0 ns 160.0 ns 240.0 ns 320.0 ns 400.0 ns 480.0 ns 560.0 ns 640.0 ns 720.0 ns 800.0 ns 880.0 ns 960.0 ns
18.175 ns
clk
button_dut
button_t
inputdata
start
output
mode_selec
t_set
duty_set
vga_output
vga_clk
vga_blank
vga_sync
20
10
0
20
10

Input & Expected Output

Input : Frequency & Duty

Output : Expected PWM wave