

Homework-1

1. Write a VHDL code to compute the following polynomial equation.

$$y = a_5x^5 + a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$$
$$= x(x(x(x(a_5x + a_4) + a_3) + a_2) + a_1) + a_0$$

with $a_5 = 0.2$, $a_4 = 0.3$, $a_3 = -0.05$, $a_2 = -0.1$, $a_1 = -0.12$, $a_0 = 0.15$,
and $x = 0.1, 0.2, 0.3$

**Format of the homework:
(word file)**

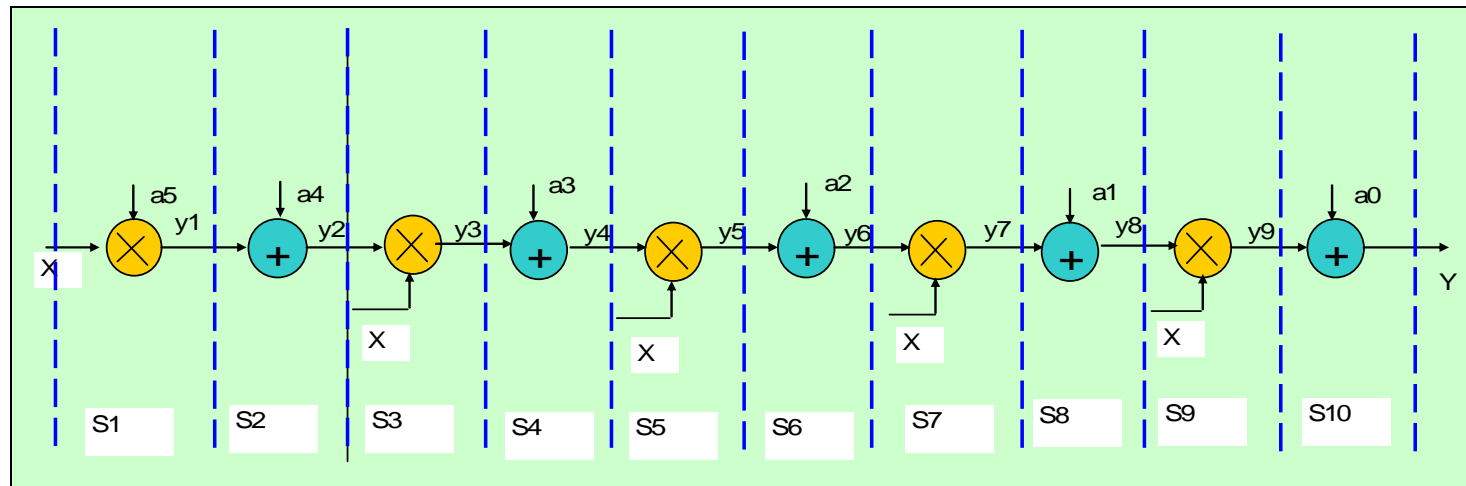
- 1. Topic**
- 2. Technique description**
- 3. VHDL code**
- 4. Simulation result**
- 5. Discussion**

2. Write a VHDL code to compute the exponential function.

$$y = e^{-x^2/\sigma^2} \quad \text{with} \quad -1 \leq x \leq 1 \quad \text{and} \quad 0.4 \leq \sigma \leq 1$$

and let $x = -0.9, -0.8, \dots, -0.1, 0, 0.1, 0.2, \dots, 0.8, 0.9$.

Hint of topic-1:



$$\begin{aligned} y &= a_5x^5 + a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0 \\ &= x(x(x(x(a_5x + a_4) + a_3) + a_2) + a_1) + a_0 \end{aligned}$$

Topic-2 : Matlab simulation

```
clear;
s=0.4;
ma=20; % order
xx=-1:0.01:1;
xi=length(xx)
for i=1:xi
x=-xx(i)^2/s^2;
y1(i)=exp(x);
mi=1;
y=1;
for m=1:ma
    mi=mi*m;
    y=y+x^m/mi;
end;
y2(i)=y;
end;
plot(xx,y1,xx,y2)
```

$$y = e^{-x^2/\sigma^2} = e^u$$
$$= 1 + u + \frac{u^2}{2!} + \frac{u^3}{3!} + \dots + \frac{u^m}{m!}$$

