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EE 456 **Homework - 12** October 29, 2020

Question: For what value of ϵ, the network would converge in 5 cycles or less.

Solution:

- I chose ϵ represented in code by e as $e = -0.2$ because there are 5 inputs i.e. $m = 5$. The general rule to select e is that $0 \leq e \leq 1/m$.
- $1/m = 1/5 = 0.2$

Following is the code and result of the network:

```
e = -0.2;
w_ii = 1.2;
Y1 = 0.1;
Y2 = 0.3;
Y3 = 0.7;
Y4 = 0.5;
Y5 = 0.2;

for i = 1:5
    Y1new = round(w_ii*Y1 + e*(Y2+Y3+Y4+Y5),2);
    Y2new = round(w_ii*Y2 + e*(Y1+Y3+Y4+Y5),2);
    Y3new = round(w_ii*Y3 + e*(Y1+Y2+Y4+Y5),2) ;
    Y4new = round(w_ii*Y4 + e*(Y1+Y2+Y3+Y5),2);
    Y5new = round(w_ii*Y5 + e*(Y1+Y2+Y3+Y4),2);
    if Y1new<=0
        Y1=0;
        fprintf('Y1 = %f\t\n', Y1);
    else
        Y1 = Y1new;
        fprintf('Y1 = %f\t\n', Y1);
    end
    if Y2new<=0
        Y2 = 0;
        fprintf('Y2 = %f\t\n', Y2);
    else
        Y2 = Y2new;
        fprintf('Y2 = %f\t\n', Y2);
    end

    if Y3new<=0
        Y3 = 0;
        fprintf('Y3 = %f\t\n', Y3);
    else
        Y3 = Y3new;
        fprintf('Y3 = %f\t\n', Y3);
```

```
    end

    if Y4new<=0
        Y4 = 0;
        fprintf('Y4 = %f\t\n', Y4);
    else
        Y4 = Y4new;
        fprintf('Y4 = %f\t\n', Y4);
    end

    if Y5new<=0
        Y5 = 0;
        fprintf('Y5 = %f\t\n', Y5);
    else
        Y5 = Y5new;
        fprintf('Y5 = %f\t\n', Y5);
    end
   fprintf('\n');

end
```

```
Y1 = 0.000000
Y2 = 0.060000
Y3 = 0.620000
Y4 = 0.340000
Y5 = 0.000000

Y1 = 0.000000
Y2 = 0.000000
Y3 = 0.660000
Y4 = 0.270000
Y5 = 0.000000

Y1 = 0.000000
Y2 = 0.000000
Y3 = 0.740000
Y4 = 0.190000
Y5 = 0.000000

Y1 = 0.000000
Y2 = 0.000000
Y3 = 0.850000
Y4 = 0.080000
Y5 = 0.000000
```

```
Y1 = 0.000000
Y2 = 0.000000
Y3 = 1.000000
Y4 = 0.000000
Y5 = 0.000000
```

After 5 cycles, everything becomes zero except $Y3$