BEE 4750/5750 Homework 2

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Problem 1

Problem 1.1

```
julia> function C(x,Co,Bo,No)
       ka=.55
       kc=.35
       kn=.25
       Cs=10
       U=10
       a1=exp(-ka*x/U)
       a2=(kc/(ka-kc))*(exp(-kc*x/U)-exp(-ka*x/U))
       a3=(kn/(ka-kn))*(exp(-kn*x/U)-exp(-ka*x/U))
       DO=Cs*(1-a1)+Co*a1-Bo*a2-No*a3
       return DO
       end
C (generic function with 1 method)

julia> function B(x,Bo)
       kc=.35
       U=10
       BOD=Bo*exp(-kc*x/U)
       return BOD
       end
B (generic function with 1 method)

julia> function N(x,No)
       kn=.35
       U=10
       NOD=No*exp(-kn*x/U)
       return NOD
       end
N (generic function with 1 method)
```

To find initial concetration of DO:

$$C_{o1} = \frac{C_{River} * Q_{River} + C_{Waste1} * Q_{Waste1}}{Q_{River} + Q_{Waste1}}$$

$$C_{o1} = \frac{7.5\frac{mg}{L} * 10^8\frac{L}{d} + 5\frac{mg}{L} * 10^7\frac{L}{d}}{10^8\frac{L}{d} + 10^7\frac{L}{d}} = 7.27\frac{mg}{L}$$

The same process is done for CBOD and NBOD at the start of the first inflow and again at the second waste flow

$$CBOD_{o1} = \frac{5\frac{mg}{L} * 10^8\frac{L}{d} + 50\frac{mg}{L} * 10^7\frac{L}{d}}{10^8\frac{L}{d} + 10^7\frac{L}{d}} = 9.09\frac{mg}{L}$$

$$NBOD_{o1} = \frac{5\frac{mg}{L} * 10^8\frac{L}{d} + 35\frac{mg}{L} * 10^7\frac{L}{d}}{10^8\frac{L}{d} + 10^7\frac{L}{d}} = 7.72\frac{mg}{L}$$

```
julia> using Plots, Distributions

julia> DO=zeros(51);

julia> DO[1]=7.27 ;

julia> for i=1:14
       DO[i+1]=C(i,7.27,9.09,7.72);
       end

julia> CBODo2=(1.1*10^8*B(15,9.09)+45*1.5*10^7)/(1.25*10^8)
10.131969670643029

julia> NBODo2=(1.1*10^8*N(15,7.72)+35*1.5*10^7)/(1.25*10^8)
8.218790523362395

julia> DO[16]=(C(15,7.27,9.09,7.72)*1.1*10^8+1.5*10^7*5)/(1.25*10^8)
4.790934363009689

julia> for i=16:50
       DO[i+1]=C(i-15,DO[15],CBODo2,NBODo2);
       end

julia> x=0:1:50;

julia> DO
51-element Vector{Float64}:
 7.27
 6.926500562491602
 6.616423267169201
 6.337506676829393
 6.087625541404662
 5.8647830153639235
```

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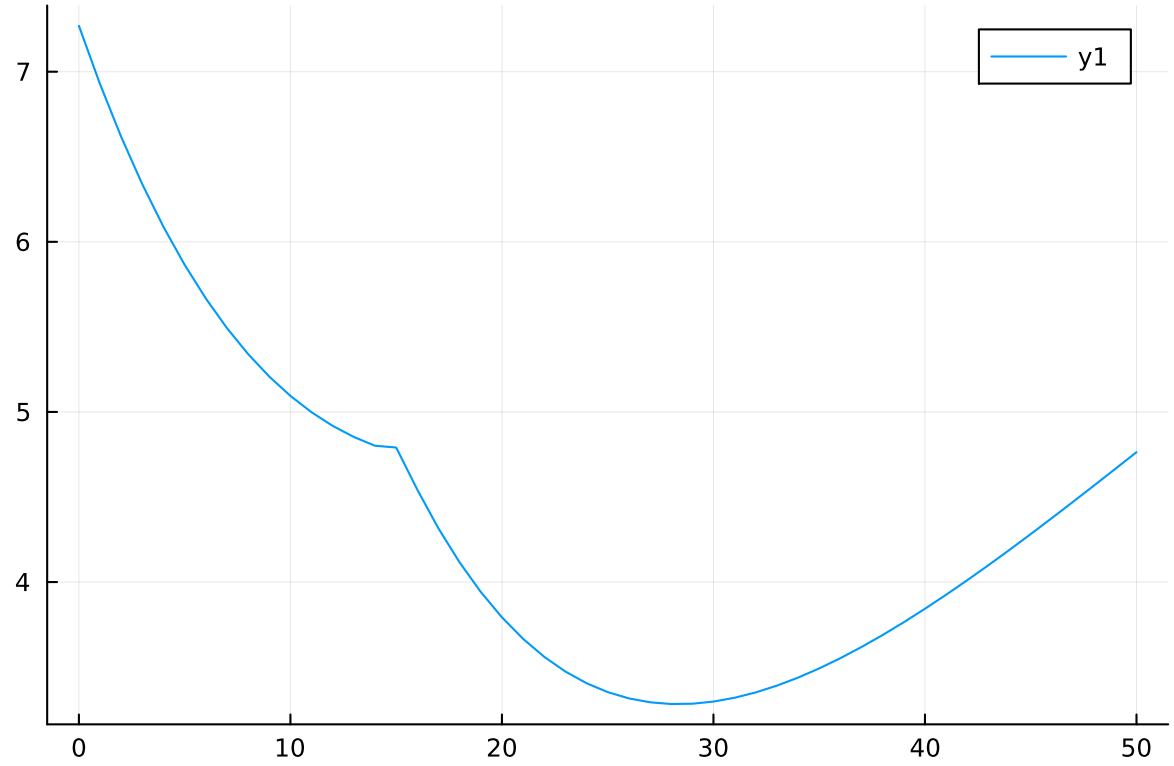
 5.667103307939309
 5.492824742471048
 5.3402932024493355
 5.207955943049692
 ⋮
 4.011013728790854
 4.09922515848754
 4.189729949344282
 4.282188214050544
 4.376285128737988
 4.471729369953127
 4.568251642540042
 4.665603293327176
 4.76355500579358

julia> plot(x,DO)
```



Problem 1.2

Problem 1.3

Problem 1.4

Problem 1.5

Problem 1.6

Problem 1.7

Problem 1.8

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References