ENVE 404 Homework 1

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Q1) Values given in the question: M= [9 6 7 2 1]; N= [3 8 4 5 2]

a) K = M+N = [12 14 11 7 3]

b) K = N-M+8 = [2 10 5 11 9]

c) K= N.*M = [27 48 28 10 2]

d) K= M.^N = [729 1679616 2401 32 1]

e) K= 2.^M-(N*4) = [500 32 11 -16 -6]

f) K= 5*M+M.^N = [774 1679646 2436 42 6]

```
close all
clc

M=[9,6,7,2,1]; %M vector
N=[3,8,4,5,2]; %N vector
Ka = M+N
Kb = N-M+8
Kc = N.*M
Kd = M.^N
Ke = 2.^M-(N*4)
Kf = 5*M+M.^N
```

Figure 1 Script for Q1

```
Ka =

    12    14    11     7     3

Kb =

     2    10     5    11     9

Kc =

    27    48    28    10     2

Kd =

         729     1679616        2401          32           1

Ke =

   500    32   112   -16    -6

Kf =

         774     1679646        2436          42           6
```

Figure 2 Resulting values of K

Q2)

Channel	n	S	B	H	Velocity
1	0.03	0.0008	7	1	0.19011
2	0.04	0.0005	9	1.5	0.10482
3	0.025	0.0001	12	2.4	0.068027
4	0.014	0.0012	10	2	0.42081

Figure 3 Table showing the parameters given in the question and the resulting velocity for each channel

```
%function for calculating velocity in channel using Manning's formula

function [v] = Velocity(n,S,B,H)
v=(sqrt(S)/n)*(B/(B+2*H))^(2/3);
```

Figure 4 Function to calculate the velocity

```
close all
clc

% S : slope;
% n : roughness coefficient;
% B : width (m);
% H : depth (m);
% Manning's velocity formula: v = (sqrt(S)/n)*(B/(B+2*H))^(2/3)

A=[0.030 0.0008 7 1.0; 0.040 0.0005 9 1.5; 0.025 0.0001 12 2.4; 0.014 0.0012 10 2.0]; %table of parameters for all channels
Vcol = [0;0;0;0]; %column for velocity values with intial value set to 0.
for row = 1:4
    n=A(row,1);
    S=A(row,2);
    B=A(row,3);
    H=A(row,4);
    Vcol(row,1) = ((S^0.5)/n)*(B/(B+2*H))^2/3;
end

vmatrix = [[1;2;3;4] A Vcol]; %creating matrix that includes channel numbers, parameters and calculated velocities.
vtable = array2table(vmatrix,'VariableNames',{'Channel','n','S','B','H','Velocity'}); %creating table that includes channel numbers, parameters and calculated velocities.
disp(vtable); %displaying created table.
```

Figure 5 Script used to calculate the velocity for each channel and to present it in a table

Q3)

a)

```
close all
clc

syms time

H=[22,147,1/6,13,1.2];  %chemical half-life values

%loop that takes the half-life value and calculates the reaction rate for
%each chemical.

for i=1:5

    time=H(1,i);
    k(i)=-log(0.5)/time;       %reaction rate formula

end

Table = table(k(:,1),k(:,2),k(:,3),k(:,4),k(:,5),'VariableNames',['Nonylphenol', '4-Choloroaniline', 'Diphenil ether', 'Fenpropimorph', 'Ethalfluralin']); %creating table
disp(Table) %displaying chemical names with their reaction rates.
```

Figure 6 Script for calculating reaction rate

Nonylphenol	4-Choloroaniline	Diphenil ether	Fenpropimorph	Ethalfluralin
0.031507	0.0047153	4.1589	0.053319	0.57762

Figure 7 Calculated reaction rates

b)

```
close all
clc

time=0:10:150; %time from day 0 to 150 with 10 day steps
Conc1=15*(exp(-0.031507*time)); %calculates concentration of Nonylphenol
plot(time,Conc1,'-xm','markeredgecolor','blue')
hold on
xlabel('Time(days)');
ylabel('Concentration(micrograms/L)')

Conc2=15*(exp(-0.053319*time)); %calculates concentration of Fenpropimorph
plot(time,Conc2,'-sr','markeredgecolor','green')
hold off
legend('Nonylphenol','Fenpropimorph')
```

Figure 8 Script for plotting the concentration of 2 chemicals with respect to time

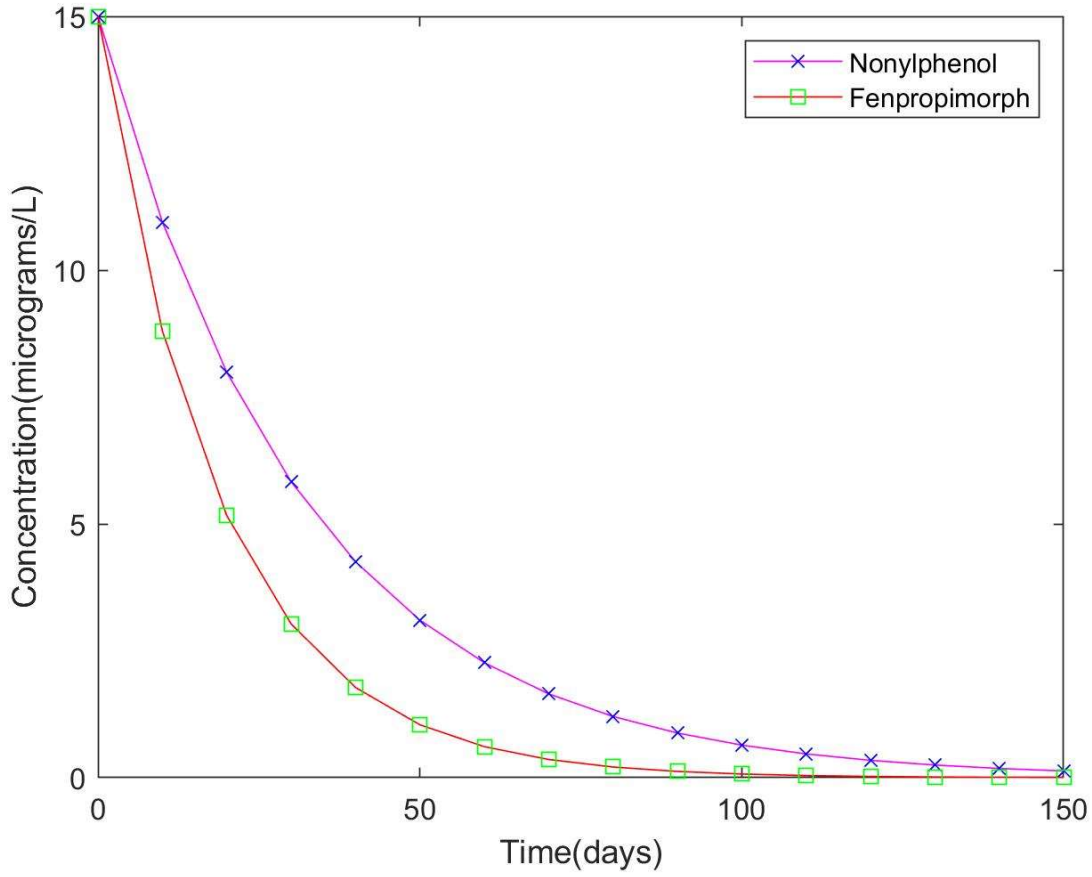

Figure 9 Plot of 2 chemical concentrations wrt time

Q4)

a)

```
% This function takes 2 values as input, first is the intial value of head
% and second is the final head value. It returns a graph showing the soil
% saturation for that interval.

function[sat]=Q4(h0,hF)

head = [h0:1:hF]; % h head values with 1 unit increments

for i=1:length(head) %calculates saturation for each head value in the interval.

if head(1,i)<10
    sat(i)=1
elseif head(1,i)>=10 & head(1,i)<100
    sat(i)=1+0.01*(10 - head(1,i))
elseif head(1,i)>=100
    sat(i)=0.1
end

end

plot(head,sat,'--r')
xlabel('Head (cm)');
ylabel('Soil saturation')

end
```

Figure 10 Function for plotting soil saturation wrt head

b)

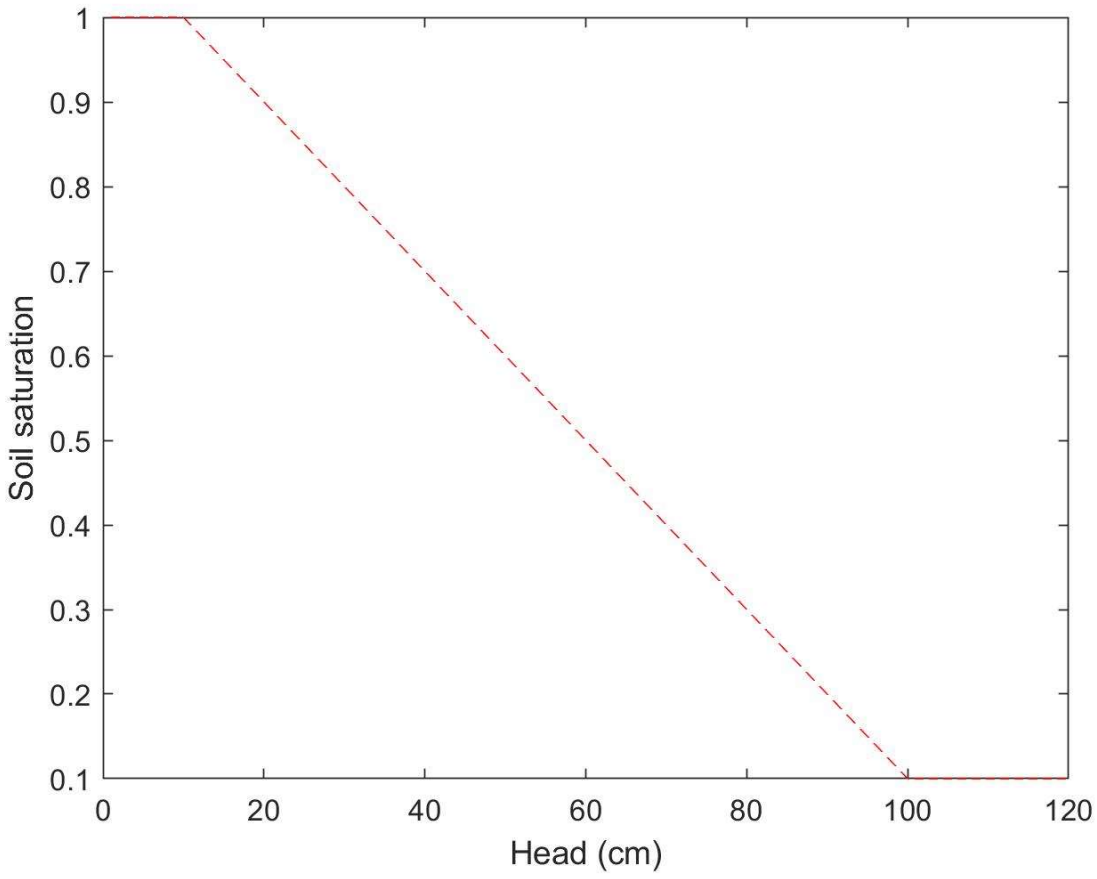

Figure 11 Plot of soil saturation for head values from 1cm to 120cm