Lab 3 (Basic Matlab introduction)

Basic flow control commands

if (example 1)

```
A=30;
B=20;

if A>B,
    C=1;
elseif A==B,
    C=2;
else
    C=3;
end
```

for (example 2)

```
n=6;
C=1;

for i=1:n,
    C=C+i;
end

C
```

for (example 3)

```
A=zeros(20,10);
c=0;

for i=1:size(A,1),
    for j=1:size(A,2),
        c=c+1;
        A(i,j)=A(i,j)+c;
    end
end

A
```

Definition and application of a function (example 4)

```
function [nf]=example4_factorial_fcn(n)
nf=1;
for i=2:n,
    nf=nf*i;
end

n=5;
[nf]=example4_factorial_fcn(n);
nf
```

Problem 2

Calculate the dimensionless temperature field of a transient 1D heat conduction problem with convection boundary condition for any of the following coordinate systems: cartesian, cylindrical, spherical! Apply the analytical solution based on the separation of variables!

```
C=[0.01 0.0998 1.0017 0.1412 1.0025 0.1730 1.0030
0.02 0.1410 1.0033 0.1995 1.0050 0.2445 1.0060
0.04 0.1987 1.0066 0.2814 1.0099 0.3450 1.0120
0.06 0.2425 1.0098 0.3438 1.0148 0.4217 1.0179
0.08 0.2791 1.0130 0.3960 1.0197 0.4860 1.0239
0.1 0.3111 1.0161 0.4417 1.0246 0.5423 1.0298
0.2 0.4328 1.0311 0.6170 1.0483 0.7593 1.0592
0.3 0.5218 1.0450 0.7465 1.0712 0.9208 1.0880
0.4 0.5932 1.0580 0.8516 1.0931 1.0528 1.1164
0.5 0.6533 1.0701 0.9408 1.1143 1.1656 1.1441
0.6 0.7051 1.0814 1.0184 1.1345 1.2644 1.1713
0.7 0.7506 1.0918 1.0873 1.1539 1.3525 1.1978
0.8 0.7910 1.1016 1.1490 1.1724 1.4320 1.2236
0.9 0.8274 1.1107 1.2048 1.1902 1.5044 1.2488
1.0 0.8603 1.1191 1.2558 1.2071 1.5708 1.2732
2.0 1.0769 1.1785 1.5995 1.3384 2.0288 1.4793
3.0 1.1925 1.2102 1.7887 1.4191 2.2889 1.6227
4.0 1.2646 1.2287 1.9081 1.4698 2.4556 1.7202
5.0 1.3138 1.2403 1.9898 1.5029 2.5704 1.7870
6.0 1.3496 1.2479 2.0490 1.5253 2.6537 1.8338
7.0 1.3766 1.2532 2.0937 1.5411 2.7165 1.8673
8.0 1.3978 1.2570 2.1286 1.5526 2.7654 1.8920
9.0 1.4149 1.2598 2.1566 1.5611 2.8044 1.9106
10.0 1.4289 1.2620 2.1795 1.5677 2.8363 1.9249
20.0 1.4961 1.2699 2.2880 1.5919 2.9857 1.9781
30.0 1.5202 1.2717 2.3261 1.5973 3.0372 1.9898
40.0 1.5325 1.2723 2.3455 1.5993 3.0632 1.9942
50.0 1.5400 1.2727 2.3572 1.6002 3.0788 1.9962
100.0 1.5552 1.2731 2.3809 1.6015 3.1102 1.9990
1000 1.5708 1.2732 2.4048 1.6021 3.1416 2.0000];
save problem2_constants C;
```

```
function [T]=problem2_heatcond_fcn(x,t,CS,Bi)
T=zeros(size(t,1),size(x,2));
load problem2_constants.mat C;
if CS==1,
    nu=interp1(C(:,1),C(:,2),Bi);
    pszi=interp1(C(:,1),C(:,3),Bi);
    for i=1:size(t,1),
        T(i,:)=pszi*exp(-nu^2*t(i,1))*cos(nu*x);
    end
elseif CS==2,
    nu=interp1(C(:,1),C(:,4),Bi);
    pszi=interp1(C(:,1),C(:,5),Bi);
    for i=1:size(t,1),
        T(i,:)=pszi*exp(-nu^2*t(i,1))*besselj(0,nu*x);
    end
elseif CS==3,
    nu=interp1(C(:,1),C(:,6),Bi);
    pszi=interp1(C(:,1),C(:,7),Bi);
    for i=1:size(t,1),
        T(i,:)=pszi*exp(-nu^2*t(i,1))*sin(nu*x)./(nu*x);
    end
end
```

```
x=linspace(0,1,41);
t=linspace(0,1,101); t=t';
CS=1;
Bi=1;
[T]=problem2_heatcond_fcn(x,t,CS,Bi);
surf(T);
```