Michael Einreinhof

Homework Submission Template

Problem 1) Place screen shot of your solution to problem 1 below.

```
[[ 0.4286]
 [ 0.8571]
 [-1.1429]
 [ 1.5714]]
```

Problem 2)

```
[[1.6591]
 [1.0267]
 [3.46  ]
 [1.755 ]
 [3.8695]
 [0.785 ]]
```

NH_4 = 1.0267gmol/gmol
O_2 = 1.6591gmol/gmol

Problem 3A) Your file should look like the follow, except your coefficients should be in place of A, and B. You do not need to solve for X but you should include it in your diagram.

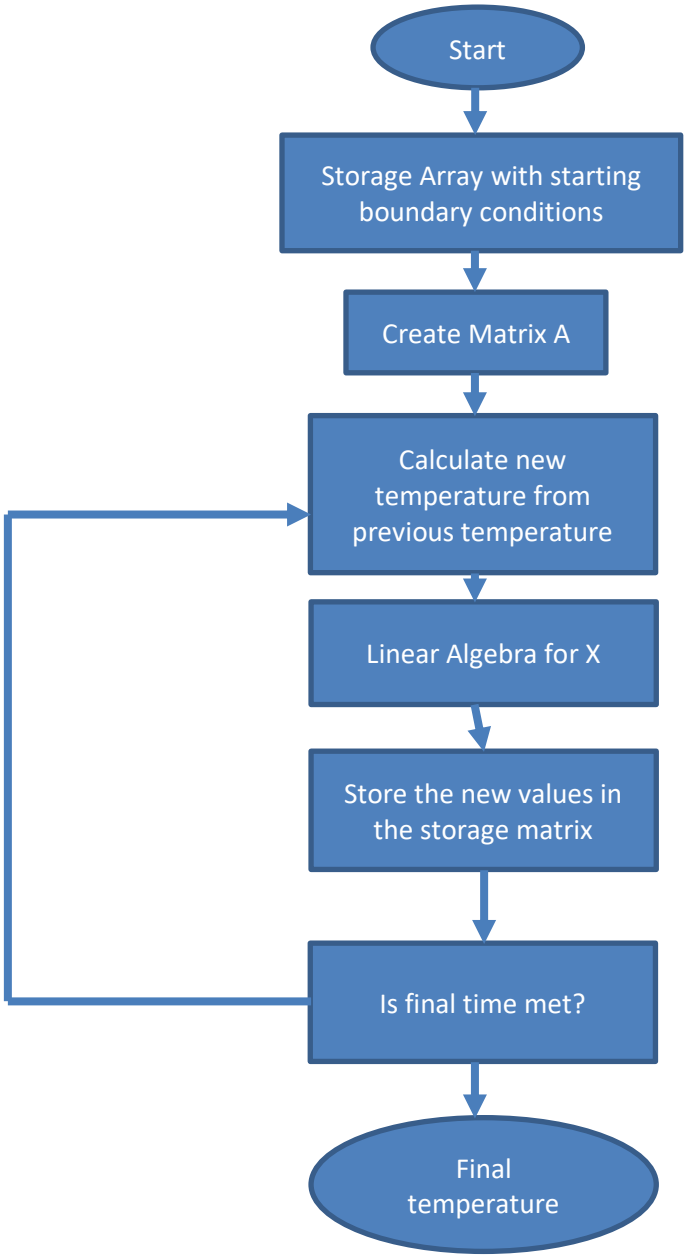
1	0	0	0	0	0	0	0	0	0	0		X		0
-.1	2.2	-.1	0	0	0	0	0	0	0	0		X		T_1
0	-.1	2.2	-.1	0	0	0	0	0	0	0		X		T_2
0	0	-.1	2.2	-.1	0	0	0	0	0	0		X		T_3
0	0	0	-.1	2.2	-.1	0	0	0	0	0		X		T_4
0	0	0	0	-.1	2.2	-.1	0	0	0	0	•	X	=	T_5
0	0	0	0	0	-.1	2.2	-.1	0	0	0		X		T_6
0	0	0	0	0	0	-.1	2.2	-.1	0	0		X		T_7
0	0	0	0	0	0	0	-.1	2.2	-.1	0		X		T_8
0	0	0	0	0	0	0	0	-.1	2.2	-.1		X		T_9
0	0	0	0	0	0	0	0	0	0	1		X		0

Problem 3B)

Set boundary conditions for time=0
Create matrix A with coefficients
Multiply the previous temperatures with equation on the right to get new temperatures
Linear algebra with matrix A and new temperature
The result is then put back into the storage matrix
Repeat multiply the previous temperatures

Michael Einreinhof

Problem 3C)



Problem 3D) Explicit solution is shown below as an example. Be sure to show the full profile.

```
implicit
0.0000,0.0000,0.2000,0.4000,0.6000,0.8000,1.0000,0.8000,0.6000,0.4000,0.2000,0.0000
0.0010,0.0000,0.2000,0.4000,0.5999,0.7983,0.9635,0.7983,0.5999,0.4000,0.2000,0.0000
0.0020,0.0000,0.2000,0.4000,0.5996,0.7939,0.9331,0.7939,0.5996,0.4000,0.2000,0.0000
0.0030,0.0000,0.2000,0.3999,0.5988,0.7877,0.9072,0.7877,0.5988,0.3999,0.2000,0.0000
0.0040,0.0000,0.2000,0.3998,0.5976,0.7803,0.8848,0.7803,0.5976,0.3998,0.2000,0.0000
0.0050,0.0000,0.1999,0.3995,0.5958,0.7722,0.8651,0.7722,0.5958,0.3995,0.1999,0.0000
0.0060,0.0000,0.1999,0.3991,0.5936,0.7637,0.8474,0.7637,0.5936,0.3991,0.1999,0.0000
0.0070,0.0000,0.1998,0.3985,0.5910,0.7550,0.8314,0.7550,0.5910,0.3985,0.1998,0.0000
0.0080,0.0000,0.1997,0.3978,0.5880,0.7462,0.8167,0.7462,0.5880,0.3978,0.1997,0.0000
0.0090,0.0000,0.1995,0.3969,0.5846,0.7375,0.8031,0.7375,0.5846,0.3969,0.1995,0.0000
0.0100,0.0000,0.1993,0.3959,0.5810,0.7288,0.7904,0.7288,0.5810,0.3959,0.1993,0.0000
0.0110,0.0000,0.1990,0.3946,0.5772,0.7203,0.7784,0.7203,0.5772,0.3946,0.1990,0.0000
0.0120,0.0000,0.1986,0.3933,0.5731,0.7118,0.7671,0.7118,0.5731,0.3933,0.1986,0.0000
0.0130,0.0000,0.1982,0.3917,0.5689,0.7036,0.7563,0.7036,0.5689,0.3917,0.1982,0.0000
0.0140,0.0000,0.1977,0.3900,0.5646,0.6955,0.7460,0.6955,0.5646,0.3900,0.1977,0.0000
0.0150,0.0000,0.1971,0.3882,0.5602,0.6875,0.7361,0.6875,0.5602,0.3882,0.1971,0.0000
0.0160,0.0000,0.1965,0.3862,0.5557,0.6797,0.7265,0.6797,0.5557,0.3862,0.1965,0.0000
0.0170,0.0000,0.1958,0.3841,0.5511,0.6721,0.7173,0.6721,0.5511,0.3841,0.1958,0.0000
0.0180,0.0000,0.1950,0.3819,0.5465,0.6646,0.7084,0.6646,0.5465,0.3819,0.1950,0.0000
0.0190,0.0000,0.1942,0.3796,0.5418,0.6572,0.6998,0.6572,0.5418,0.3796,0.1942,0.0000
0.0200,0.0000,0.1933,0.3773,0.5371,0.6500,0.6914,0.6500,0.5371,0.3773,0.1933,0.0000
```

Problem 3E)

Table 1

Time	Explicit Solution x=0.3	Analytical Solution x=0.3	Difference	Percent Error
0.01	0.5859	0.5839	.002	0.34%
0.02	0.542	0.5382	.0038	0.706%
0.1	0.2497	0.2468	.0029	1.175%

Table 2

Time	Implicit Solution x=0.3	Analytical Solution x=0.3	Difference	Percent Error
0.01	0.581	0.5839	.0029	0.496%
0.02	0.5371	0.5382	.0011	0.204%
0.1	0.2484	0.2468	.0016	0.644%

Table 3

Time	Explicit Solution x=0.3	Implicit Solution x=0.3	Difference	Percent Error
0.01	0.5859	0.5839	.002	0.34%
0.02	0.542	0.5382	.0038	0.706%
0.1	0.2497	0.2468	.0029	1.175%