

Computer Science/Mathematics 261 Assignment 8 Solutions

Question 1. Matlab Octave Code

```
function A = relax4(r,c,m)
% create an rXc matrix with 1 top and boundary = 1
% zeros on the left and right boundary
% with 1's in the corners
% relax the interior entries in a systematic way
% m is the iterations

A = zeros(r,c);
A(1,:)=1; % row 1 = 1
A(r,:)=1; % row r = 1

for k=1:m
    for i=2:r-1
        for j=2:c-1
            A(i,j)=0.25*(A(i,j-1)+A(i,j+1)+A(i-1,j)+A(i+1,j));
        end
    end
end
```

Question 2 - 4x4 plate

```
1 1 1 1
0 a a 0
0 a a 0
1 1 1 1
```

$a=1/2$

Question 3 - 4x6 plate

```
1 1 1 1 1 1
0 a b b a 0
0 a b b a 0
1 1 1 1 1 1
```

$4a = a + b + 1$
 $4b = a + 2b + 1$

$a = 3/5$
 $b = 4/5$

Question 5 - 8x10 plate

Need at least 46 iterations to get 5 decimal places of accuracy.

```
>> format long
>> A = relax4(8, 10, 100)
```

A =

Columns 1 through 4

1.0000000000000000	1.0000000000000000	1.0000000000000000	1.0000000000000000
0	0.512654916536913	0.717821014040963	0.809149580851543
0	0.332798661815139	0.549479573140563	0.672916772330656
0	0.269060171256256	0.474381864000315	0.604605863821440
0	0.269060173661731	0.474381868160960	0.604605868980466
0	0.332798667615567	0.549479583173309	0.672916784770843

assign8.txt

0	0. 512654921926565	0. 717821023363208	0. 809149592410738
1. 0000000000000000	1. 0000000000000000	1. 0000000000000000	1. 0000000000000000

Columns 5 through 8

1. 0000000000000000	1. 0000000000000000	1. 0000000000000000	1. 0000000000000000
0. 845860553658211	0. 845860556495121	0. 809149588352958	0. 717821023363208
0. 728432093871967	0. 728432098576638	0. 672916784770843	0. 549479588600377
0. 666518972980075	0. 666518978379314	0. 604605878098216	0. 474381881742517
0. 666518978379314	0. 666518983348398	0. 604605882119822	0. 474381884489654
0. 728432106891387	0. 728432110558810	0. 672916794468318	0. 549479595224669
0. 845860565755620	0. 845860567628738	0. 809149597363676	0. 717821029518380
1. 0000000000000000	1. 0000000000000000	1. 0000000000000000	1. 0000000000000000

Columns 9 through 10

1. 0000000000000000	1. 0000000000000000
0. 512654923529108	0
0. 332798673410847	0
0. 269060184563881	0
0. 269060185909148	0
0. 332798676654748	0
0. 512654926543282	0
1. 0000000000000000	1. 0000000000000000