THE UNIVERSITY OF TEXAS AT ARLINGTON, TEXAS
DEPARTMENT OF ELECTRICAL ENGINEERING

EE 5329

Distributed Decision and Control

TAKE HOME EXAM 3

by

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Presented to

Dr. Frank Lewis

May 1, 2018

EE 5329 Distributed Decision and Control

Spring 2018

Exam Pledge of Honor

On all exams in this class - YOU MUST WORK ALONE.

Any cheating or collusion will be severely punished.

It is very easy to compare your software code and determine if you worked together

It does not matter if you change the variable names.

Please sign this form and include it as the first page of all of your submitted homeworks.

....

Typed Name: Soutrik Maiti

Pledge of honor:

"On my honor I have neither given nor received aid on this homework."

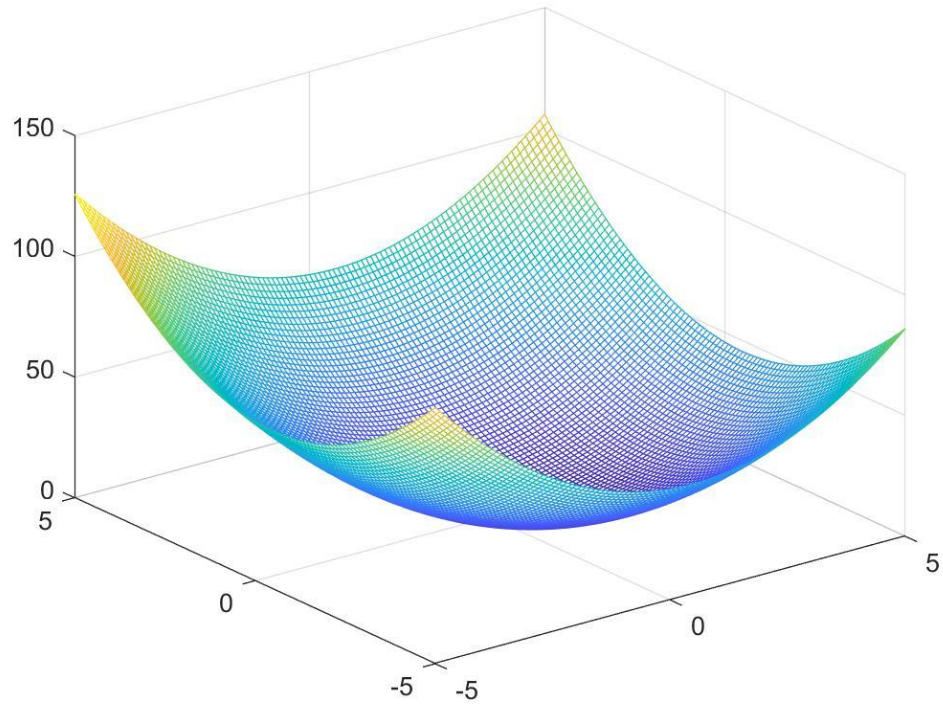
e-Signature: Soutrik Maiti

Problem 1:

MATLAB Code –

```
clc;
clear all;
close all;

%% A matrix for undirected tree
a = [0 0 1 0 0 0;
1 0 0 0 0 1;
1 1 0 0 0 0;
0 1 0 0 0 0;
0 0 1 0 0 0;
0 0 0 1 1 0;];

x1 = [1 1];
x2 = [1 -1];
x3 = [-1 -1];
x4 = [-1 1];
x5 = [2 0];
x6 = [-2 0];

x = [x1;x2;x3;x4;x5;x6];

x2_V = -5:0.1:5;

v1 = zeros(length(x2_V),length(x2_V));

for m = 1:length(x2_V)
    for n = 1:length(x2_V)
    for j = 1:6
        v = a(2,j)*((x(j,:)-[x2_V(m) x2_V(n)])*(x(j,:)-[x2_V(m) x2_V(n)])');
       v1(m,n) = v1(m,n) + v;
    end
    end

end

mesh(x2_V,x2_V,v1)
```

The partial potential V2(x2) is shown in the following:



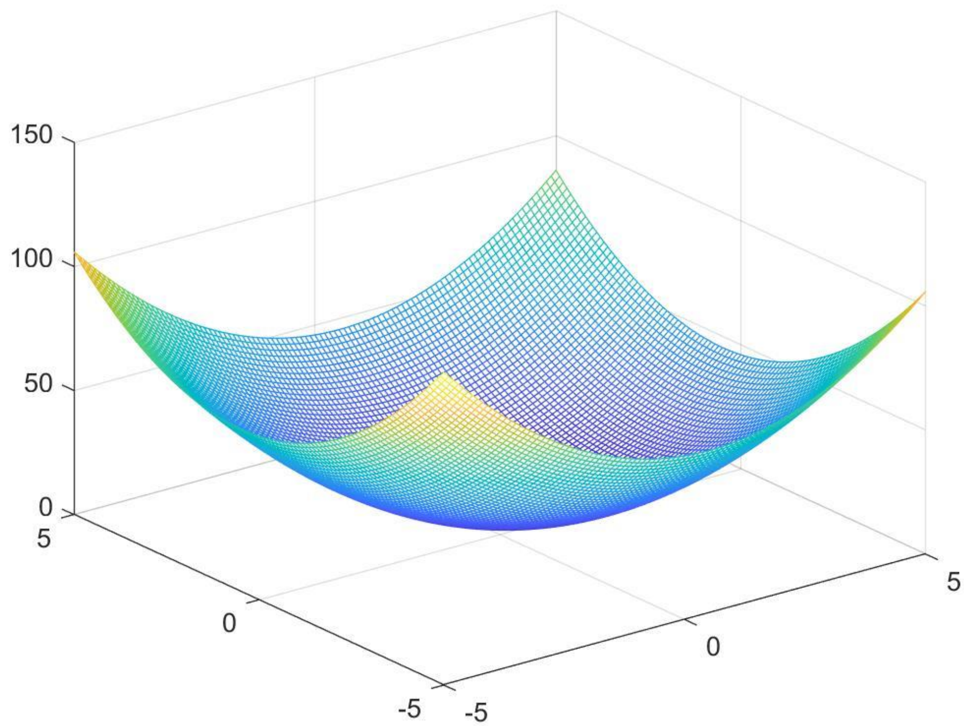
Problem 2:

MATLAB Code –

```
clc;
clear all;
close all;

%% A matrix for undirected tree
a = [0 0 1 0 0 0;
1 0 0 0 0 1;
1 1 0 0 0 0;
0 1 0 0 0 0;
0 0 1 0 0 0;
0 0 0 1 1 0;];

x1 = [1 1];
x2 = [1 -1];
x3 = [-1 -1];
x4 = [-1 1];
x5 = [2 0];
x6 = [-2 0];

x = [x1;x2;x3;x4;x5;x6];

x6_V = -5:0.1:5;

v1 = zeros(length(x6_V),length(x6_V));

for m = 1:length(x6_V)
```

```
    for n = 1:length(x6_V)
    for j = 1:6
        v = a(6,j)*((x(j,:)-[x6_V(m) x6_V(n)])*(x(j,:)-[x6_V(m) x6_V(n)])');
       v1(m,n) = v1(m,n) + v;
    end
    end

end

mesh(x6_V,x6_V,v1)
```

The plot of V6(x6) as x6 varies is as follows:



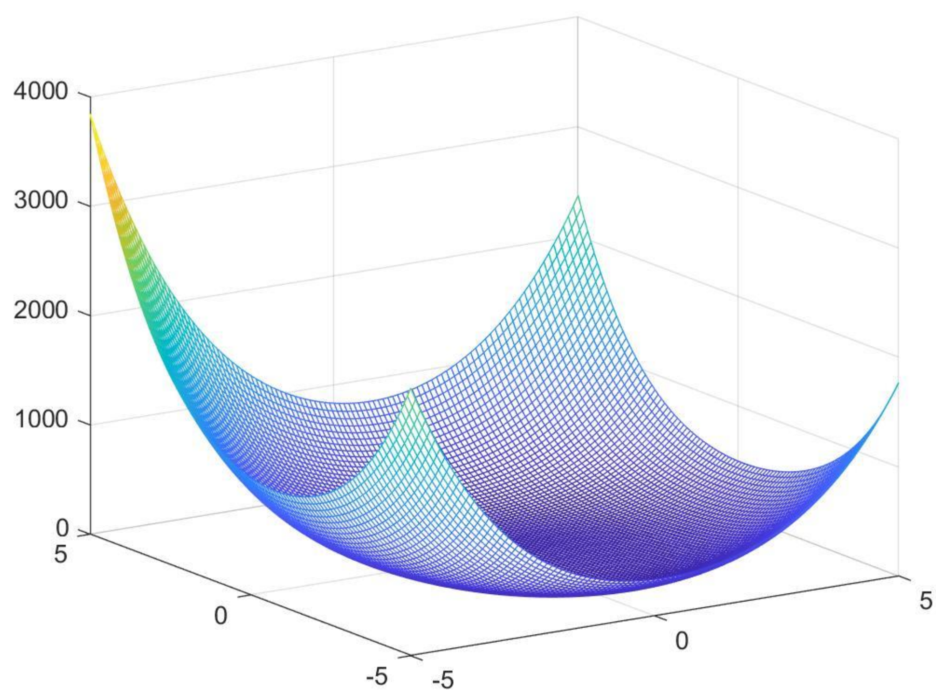
Problem 3:

MATLAB Code -

```
%% A matrix for undirected tree
a = [0 0 1 0 0 0;
1 0 0 0 0 1;
1 1 0 0 0 0;
0 1 0 0 0 0;
0 0 1 0 0 0;
0 0 0 1 1 0;];
%% Position of agents
x1 = [1 1];
```

```
x2 = [1 -1];
x3 = [-1 -1];
x4 = [-1 1];
x5 = [2 0];
x6 = [-2 0];

x = [x1;x2;x3;x4;x5;x6];
%% varying x2
x2_V = -5:0.1:5;

v1 = ones(length(x2_V),length(x2_V));
%% Algorithm for given equation
for m = 1:length(x2_V)
    for n = 1:length(x2_V)
     for j = 1:6
        if j == 1||j == 6
        v = a(2,j)*((x(j,:)-[x2_V(m) x2_V(n)])*(x(j,:)-[x2_V(m) x2_V(n)])');
       v1(m,n) = v1(m,n) * v;
        end
    end
    end

end
%% 3D plot of given equation
mesh(x2_V,x2_V,v1)
```

The plot is as follows:



b) The new function gives a flat base whereas the original Laplacian gave a curved bottom having a particular minimum as seen from the image.