

```

% Number of levels in the binary tree
L = 4; % Change this value as per your requirement

% Number of nodes
N = 2^L - 1;

% Weights for each edge
weights = rand(N, 1) * 10;

% Adjacency matrix
adjMatrix = zeros(N);
for i = 1:(N-1)/2
    adjMatrix(i, 2*i) = weights(2*i);
    adjMatrix(2*i, i) = weights(2*i);
    adjMatrix(i, 2*i + 1) = weights(2*i + 1);
    adjMatrix(2*i + 1, i) = weights(2*i + 1);
end

G = graph(adjMatrix);

% Visualization
nodeColor = 'red';
figure;
plot(G, 'NodeColor', nodeColor);

% Calculate Degree Centrality
degreeCentrality = centrality(G, 'degree');
disp('Degree Centrality:');
disp(degreeCentrality);

%Calculate ShortestPath
shortestPaths = distances(G);
disp('Shortest Paths:');
disp(shortestPaths);

%Calculate Betweenness Centrality
betweennessCentrality = centrality(G, 'betweenness');
disp('Betweenness Centrality:');
disp(betweennessCentrality);

%Calculate Network Diameter
diameter = max(max(shortestPaths));
disp('Network Diameter:');
disp(diameter);

%Calculate Closeness Centrality
closenessCentrality = centrality(G, 'closeness');
disp('Closeness Centrality:');
disp(closenessCentrality);

%Example groups
group = ones(1, N);

%Calculate Network Modularity
[Q,Qv] = modularity(adjMatrix,group);
disp('Modularity:');
disp(Q);

%Calculate Network Resilience

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```

resilience = zeros(N, 1);
for i = 1:N
    tempAdjMatrix = adjMatrix;
    tempAdjMatrix(i, :) = 0; % Remove node i and its connections
    tempAdjMatrix(:, i) = 0;
    [bins, ~] = conncomp(graph(tempAdjMatrix));
    resilience(i) = max(bins); % Measure connectivity
end

disp('Resilience Index:');
disp(resilience);

```

Degree Centrality:

2
3
3
3
3
3
3
1
1
1
1
1
1
1
1

Shortest Paths:

Columns 1 through 7

0	6.2206	3.5095	11.3530	10.2386	4.2692	5.9087
6.2206	0	9.7301	5.1325	4.0181	10.4897	12.1292
3.5095	9.7301	0	14.8626	13.7482	0.7597	2.3992
11.3530	5.1325	14.8626	0	9.1506	15.6222	17.2617
10.2386	4.0181	13.7482	9.1506	0	14.5078	16.1473
4.2692	10.4897	0.7597	15.6222	14.5078	0	3.1588
5.9087	12.1292	2.3992	17.2617	16.1473	3.1588	0
12.5862	6.3657	16.0958	1.2332	10.3838	16.8554	18.4949
13.1921	6.9716	16.7016	1.8391	10.9897	17.4613	19.1008
12.6382	6.4176	16.1477	11.5501	2.3995	16.9073	18.5468
14.4113	8.1908	17.9208	13.3232	4.1727	18.6805	20.3200
4.7657	10.9863	1.2562	16.1188	15.0044	0.4965	3.6554
13.2964	19.5169	9.7868	24.6494	23.5350	9.0272	12.1860
15.3566	21.5771	11.8470	26.7096	25.5952	12.6067	9.4479
10.8173	17.0379	7.3078	22.1704	21.0560	8.0675	4.9086

Columns 8 through 14

12.5862	13.1921	12.6382	14.4113	4.7657	13.2964	15.3566
6.3657	6.9716	6.4176	8.1908	10.9863	19.5169	21.5771
16.0958	16.7016	16.1477	17.9208	1.2562	9.7868	11.8470
1.2332	1.8391	11.5501	13.3232	16.1188	24.6494	26.7096
10.3838	10.9897	2.3995	4.1727	15.0044	23.5350	25.5952
16.8554	17.4613	16.9073	18.6805	0.4965	9.0272	12.6067
18.4949	19.1008	18.5468	20.3200	3.6554	12.1860	9.4479
0	3.0723	12.7833	14.5564	17.3520	25.8826	27.9428
3.0723	0	13.3892	15.1623	17.9579	26.4885	28.5487

12.7833	13.3892	0	6.5722	17.4039	25.9345	27.9947
14.5564	15.1623	6.5722	0	19.1770	27.7077	29.7679
17.3520	17.9579	17.4039	19.1770	0	9.5237	13.1032
25.8826	26.4885	25.9345	27.7077	9.5237	0	21.6339
27.9428	28.5487	27.9947	29.7679	13.1032	21.6339	0
23.4036	24.0095	23.4555	25.2286	8.5640	17.0946	14.3565

Column 15

10.8173
17.0379
7.3078
22.1704
21.0560
8.0675
4.9086
23.4036
24.0095
23.4555
25.2286
8.5640
17.0946
14.3565
0

Betweenness Centrality:

49
57
57
25
25
25
25
0
0
0
0
0
0
0
0

Network Diameter:

29.7679

Closeness Centrality:

0.0294
0.0286
0.0286
0.0227
0.0227
0.0227
0.0227
0.0175
0.0175
0.0175
0.0175
0.0175
0.0175
0.0175
0.0175

Modularity:
0

Resilience Index:
3
4
4
4
4
4
4
2
2
2
2
2
2
2
2

