UAS in Discrete Math made by Michael Marchenko in July of 2018

Edited at 10am 27.7.2018.

s is your student number. k = s mod 10000. T = s mod 100. m = s mod 35. a = s mod 25.

L = s mod 10. $d\_{2}=\frac{T-L}{10}$. e = s mod 8. m7 = s mod 7. m6 = s mod 6. m5 = s mod 5. m4 = s mod 4.

m3 = s mod 3. m2 = s mod 2. u = s + 10000.

**Graph Theory and Trees Theory:**

1. How many edges are there in KT, K(a+1),(m+1)?

2. Find adjacency and incidence matrixes for the graphs:

m6 = 0: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student16number16graph16.docx

m6 = 1: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees16graphs2solve16.docx

m6 = 2: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student4number4graph.docx

m6 = 3: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student3number3graph.docx

m6 = 4: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees24graphs2solve.docx

m6 = 5: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees4graphs2solve.docx

2.2. Find the number of faces for your graph.

2.3. Do graceful labeling of your graph.

http://azspcs.com/Contest/GracefulGraphs

3. Give Euler’s, Hamiltonian’s cycles, and paths in the graphs:

m4 = 0: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student16number16graph16.docx

m4 = 1: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees16graphs2solve16.docx

m4 = 2: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/euler6cycle.ppt

m4 = 3: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/question2euler.ppt

4. Apply Dijkstra’s, Prim's and Kruskal’s algorithms to the graphs. Traverse the trees.

m6 = 0: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student16number16graph16.docx

m6 = 1: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees16graphs2solve16.docx

m6 = 2: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student4number4graph.docx

m6 = 3: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student3number3graph.docx

m6 = 4: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees24graphs2solve.docx

m6 = 5: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees4graphs2solve.docx

5. Is the graph planar? Why?

m7 = 0: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/graph22jun16.docx

m7 = 1: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/graph7am22jun16.docx

m7 = 2: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/graph8am22jun16.docx

m7 = 3: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/graph1pm22june16.docx

m7 = 4: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/student16number16graph16.docx

m7 = 5: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/trees16graphs2solve16.docx

m7 = 6: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/planar4graphs.ppt

6. Solve the Graceful Graph Problem for *(e+3)* vertices.

http://azspcs.com/Contest/GracefulGraphs

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code5better.txt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code6.txt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/7code7.txt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/8code.txt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/9code.txt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/10code10.txt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/11code11.txt

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/12code12.txt

http://azspcs.com/Contest/GracefulGraphs

6.2. What is the number of faces for your graceful graph?

6.3. Is your graceful graph planar? Why?

https://en.wikipedia.org/wiki/Kuratowski%27s\_theorem

7. Find the graceful labeling of $K\_{m\_{3}+2, m\_{4}+2}$

ii = FreeFile

Open "D:\bipartate33k.txt" For Output As #ii

Dim e(9)

e(1) = 9

Max = 8

For v1 = 1 To Max - 3

For v2 = v1 + 1 To Max - 2

For v3 = v2 + 1 To Max - 1

For v4 = v3 + 1 To Max

e(2) = v4

e(3) = v3

e(4) = Abs(9 - v1)

e(5) = Abs(v4 - v1)

e(6) = Abs(v3 - v1)

e(7) = Abs(9 - v2)

e(8) = Abs(v4 - v2)

e(9) = Abs(v3 - v2)

If e(1) <> e(2) And e(1) <> e(3) And e(1) <> e(4) And e(1) <> e(5) Then GoTo 11

GoTo 10

11 If e(1) <> e(6) And e(1) <> e(7) And e(1) <> e(8) And e(1) <> e(9) Then GoTo 111

GoTo 10

111 If e(2) <> e(3) And e(2) <> e(4) And e(2) <> e(5) And e(2) <> e(6) And e(2) <> e(7) And e(2) <> e(8) Then GoTo 22

GoTo 10

22 If e(2) <> e(9) Then GoTo 222

GoTo 10

222 If e(3) <> e(4) And e(3) <> e(5) And e(3) <> e(6) And e(3) <> e(7) And e(3) <> e(8) And e(3) <> e(9) Then GoTo 33

GoTo 10

33 If e(4) <> e(5) And e(4) <> e(6) And e(4) <> e(7) And e(4) <> e(8) And e(4) <> e(9) Then GoTo 44

GoTo 10

44 If e(5) <> e(6) And e(5) <> e(7) And e(5) <> e(8) And e(5) <> e(9) Then GoTo 55

GoTo 10

55 If e(6) <> e(7) And e(6) <> e(8) And e(6) <> e(9) Then GoTo 66

GoTo 10

66 If e(7) <> e(8) And e(7) <> e(9) Then GoTo 77

GoTo 10

77 If e(8) <> e(9) Then GoTo 1

10 Next v4

Next v3

Next v2

Next v1

GoTo 2

1 Print #ii, v1, v2, v3, v4

2 End Sub

8. Color your graphs using as few colors as possible. Find the chromatic numbers of the graphs.

9. Color the map of the country number T using as few colors as possible.

http://www.worldometers.info/geography/alphabetical-list-of-countries/

10. Solve the trade graph.

Graph Indonesian international trade.

Weights are the percentages.

Optimize the trade.

USA 13

China 12

Japan 11

European Union 10

Singapore 9

India 8

Korea 7

Middle East 6

Malaysia 5

Thailand 4

Philippines 3

Australia 2

Russia 1

https://atlas.media.mit.edu/en/profile/country/idn/

Bad relations are between:

USA and China,

USA and Russia,

USA and Middle East,

Malaysia and Russia,

Australia and Russia.

Take e + 6 countries.

10.2. Do graceful labeling of your trade graph.

http://azspcs.com/Contest/GracefulGraphs

10.3. Is your trade graph planar? Why?

10.4. Find the number of regions in your trade graph.

11. Find the number of regions for the graph with L+20 edges and e+10 vertices.

11.2. Petersen graph:

m6 = 0: Does Petersen graph satisfy the condition e < 2v – 4?

m6 = 1: Does Petersen graph satisfy the condition e < 3v – 6?

m6 = 2: Is this graph planar?

m6 = 3: Why?

m6 = 4: Which important graph is Petersen graph similar to?

m6 = 5: Do graceful labeling of Petersen graph.

http://azspcs.com/Contest/GracefulGraphs

https://en.wikipedia.org/wiki/Petersen\_graph

https://en.wikipedia.org/wiki/Planar\_graph

https://en.wikipedia.org/wiki/Kuratowski%27s\_theorem

12. Explain your project.

**Boolean algebra:**

13. Simplify the expression for your *e*.

e = 0: A´BC + BC + AB´ + ABC + AC´ + BC´

e = 1: AB´C + B´C + A´B´ + ABC´ + AC´ + BC´

e = 2: B´C + B´C + A´B´C´ + ABC´ + AB´C´ + BC´

e = 3: BC´ + B´C + A´B´C´ + ABC´ + AB´C´ + B´C´

e = 4: A´BC + BC + AB´ + ABC + AC´ + BC´ + A´B´C

e = 5: A´BC + AB´ + ABC + AC´ + BC´ + A´B´C

e = 6: BC + AB´ + ABC + AC´ + BC´ + A´B´C

e = 7: A´BC´ + BC + AB´ + AC´ + BC´ + A´B´C

Use Karnaugh Map.

https://en.wikipedia.org/wiki/Karnaugh\_map

14. Find the function for your truth table for your *e*.

e = 0: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e0\_truth\_table.docx

e = 1: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e1\_truth\_table.docx

e = 2: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e2\_truth\_table.docx

e = 3: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e3\_truth\_table.docx

e = 4: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e4\_truth\_table.docx

e = 5: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e5\_truth\_table.docx

e = 6: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e6\_truth\_table.docx

e = 7: http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/e7\_truth\_table.docx