Mid-Term Revision Paper in discrete math 2017 May:

Edited at 11am 1 May 2017.

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. m4 = s mod 4. m3 = s mod 3.

m2 = s mod 2.

Sets:

1. How many subsets are there in a set of m elements?

 http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/1sets.ppt

Logic:

2. Give your own example of application of fuzzy logic.

3. Explain

m4 = 0: axiom.

m4 = 1: theorem.

m4 = 2: lemma.

m4 = 3: corollary.

4. Explain

m2 = 0: duality principle

m2 = 1: inclusion-exclusion principle

Proofs:

5. Prove that $\sum\_{i=0}^{T}b^{i}=\frac{1-b^{T+1}}{1-b}$, *b* ≠ 1.

 http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/3proofs.ppt

 http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/4sequences.ppt

6. Prove the expression for $\sum\_{c=1}^{j}c^{L}$

 http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/3proofs.ppt

 http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/4sequences.ppt

Relations:

7. Binary relation R on the set {1 to e+2} is defined so that *a*R*b* holds if and only if

 *a* divides *b*, with remainder. Find the matrix and draw the graph.

 Is it reflexive, symmetric, anti-symmetric, transitive, composite?

 http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/5relations.ppt

8. Binary relation R on the set {1 to e+2} is defined so that *a*R*b* holds if and only if

 *a* divides *b*, with NO remainder. Find the matrix and draw the graph.

 Is it reflexive, symmetric, anti-symmetric, transitive, composite?

 http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/5relations.ppt

9. Combined relations.

Relation A:

Binary relation R on the set {1 to e+2} is defined so that *a*R*b* holds if and only if

 *a* divides *b*, with remainder.

Relation B:

Binary relation R on the set {1 to e+2} is defined so that *a*R*b* holds if and only if

 *a* divides *b*, with NO remainder.

Find each combined relation.

Give the pairs.

Find the matrix and draw the graph.

Is it reflexive, symmetric, anti-symmetric, transitive, composite?

m2 = 0: A and B.

m2 = 1: A or B.

10.

m2 = 0: Find A and B or A.

m2 = 1: Find B or A and B.

Matrices:

11. Matrices.

m2 = 0: Give main matrices operations

m2 = 1: What is symmetric and what is anti-symmetric matrix?

Number theory in discrete math:

12. Find Highest Common Divisor and Lowest Common Multiple of e+4 and L+4.

Use all algorithms, which you can (Euclidean algorithm, etc.)

 http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/euclidean4algorithm.txt

13. Convert T to e+2 and L+2 numeral systems.

 http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/number2convert.txt

14. Calculate the largest prime number you can using your own computer code.

http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/primes2find.txt

15. Give prime factorization of s.

 http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/prime4factorization4of4numbers.txt

16. Calculate.

a. s mod k

b. k mod T

c. T mod L

d. k mod m

e. s mod a

17. Find the closest prime number to your s.

18.

m2 = 0: What is linear combination?

https://en.wikipedia.org/wiki/Linear\_combination

m2 = 1: Explain Chinese Remainder Theorem.

https://en.wikipedia.org/wiki/Chinese\_remainder\_theorem

19. Explain

m4 = 0: Hash function

m4 = 1: Cryptography

m4 = 2: Data Encryption Standard

m4 = 3: RSA

Combinatorics:

20. Calculate C(9,e) and P(7,e).

21. Give all the options for C(e+3,e).

 http://discrete4math.weebly.com/uploads/2/5/3/9/25393482/calculator4combinations.txt

22. In how many ways can you answer an exam with m+1 questions

 each of which has e+1 options for the answer?

23. Explain

m3 = 0: Multiplication Principle

m3 = 1: Addition Principle

m3 = 2: Pigeon Hole Principle

Discrete Probability:

24. Draw the histogram of tossing L+2 fair coins. Draw the histogram of the first e+3 digits of π.

25. Give the histogram of Benford of the first digit of e+2 the most populated countries.

http://www.worldometers.info/world-population/population-by-country/

Project:

26. Improve your project.

Deadline: before the Mid-Term Exam.