

Math/Csci 2610 Fall 2004

Instructor: Zubeyir Cinkir

Exam 2

Date: Oct. 21, 2003

Duration: 50 min

Direction: For full credit, write down your arguments as clearly as possible and in an organized way, (so that also it can be used to give a partial credit).

Name: _____

Question#1: (10pts) Answer the followings:

1. (5 pts) Find the value table of the Boolean function $F(x,y)=\bar{y}x+y$

2. (5 pts) Let the Boolean function $F(x,y,z)=1$ iff $x+yz=0$. Write the sum-of-product expansion for F.

Question#2: (10pts)

Construct a circuit from **inverters**, **AND** gates, and **OR** gates to the output $x+(\bar{x}+z)y$

Question#3: (7pts) By using Buble Sort algorithm step by step, give an ordering of the list {7,4,1,3}.

Question#4: (12pts) Find as good big-O estimate as possible to the following

1. (4 pts) $2700n^3 - 3500n^2 + n + 300$

2. (4 pts) $3n^2 \log n + 5n + 48000$

3. (4 pnts) $n^2 + n + \log n!$

Question#5: (7pts) Is 109 prime? Explain and support your answer by valid arguments.

Question#6: (10pts) Show that there are infinitely many primes.

Question#7: (10pts) Find $\gcd(732, 324)$.

Question#8: (15pts) Answer the followings

1. (2 pts) Find value of $-75 \pmod{13}$

2. (3 pts) Find an x value such that $2x \equiv 2 \pmod{5}$.

3. (10 pts) Find all positive solutions that are less than 160 to the system of congruences

$$x \equiv 2 \pmod{4}.$$

$$x \equiv 1 \pmod{3}.$$

$$x \equiv 3 \pmod{5}.$$

Question#9: (10pts)

1. (6 pts) Convert $(321)_4$ into base 3.

2. (4 pts) Convert $(101011)_2$ into decimal.

Question#10: (10pts) Do the following matrix operations

1. (5 pts) $\begin{bmatrix} 0 & 1 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} -1 & 2 \\ -2 & 1 \end{bmatrix}$

2. (5 pts) $\begin{bmatrix} 3 & -1 \\ 2 & 1 \end{bmatrix} + \begin{bmatrix} 0 & 5 \\ 4 & 2 \end{bmatrix}$

Question#11: (5pts) (Bonus) Find the determinant of the matrix $\begin{bmatrix} 5 & 3 \\ 4 & 2 \end{bmatrix}$

Question#12: (5pts) (Bonus) Give a complete argument to show that $56^{102} \equiv 1 \pmod{103}$.