CSE 40534 HW #2 Name:_____

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1. Give an example and briefly explain the advantage and disadvantage of using each of the following fault tolerant techniques.
   a) Graceful degradation
   b) Algorithmic-based fault tolerance
   c) Utilizing spares

Solution (details are omitted since almost everyone got them right):
   a) finding a fault-free subcube in a faulty hypercube.
   b) Matrix multiplication
   c) Spare in hypercube or mesh topology

2. Consider a 5-dimensional hypercube.
   a) How many 4 dimensional subcubes are available in such a hypercube. List them.
   b) How many fault-free 4-dimensional subcubes are available if the link connecting node 11011 and node 10011 is broken? List them.
   c) How many fault-free 4-dimensional subcubes are available if in addition to the above link, nodes 11010 and 01000 are faulty. List them.

Solution:
a.

$$\binom{5}{4} = 5!/4! = 5$$

5 X 2 = 10 4-dimensional subcubes

0XXXX X0XXX XX0XX XXX0X XXXX0
1XXXX X1XXX XX1XX XXX1X XXXX1

b.

6 good ones:

0XXXX X0XXX XXX0X XXXX0
X1XXX XX1XX

c.
2 good ones:

X0XXX XX1XX