1. (10%)(1)Six microprocessors are randomly selected from a set of 100 microprocessors among which 10 are defective. Find the probability of obtaining no defective microprocessors.
   (2)Suppose that a microprocessor is selected at random among 90 microprocessors, where 35 are over 1.0G Hz, 20 are bad, and 15 are over 1.0 GHz and bad. What is the probability that the microprocessor selected is over 1.0GHz or a bad one?
2. (10%)The complement of a simple graph ***G*** is the simple graph ***G'*** with the same vertices as ***G***. An edge exists in ***G'*** if and only if it does not exist in ***G***. A simple graph ***G*** is self-complementary if ***G*** and ***G'*** are isomorphic. Find a self-complementary graph having five vertices. (Note that the proof that ***G*** and ***G'*** are isomorphic is required.)
3. (15%)Write an algorithm that tests if the given two $n \times n$ matrices are equal and find a theta notation for its worst-case time.
4. (20%)We assume an economics model to describe the supply and demand by linear equations. The demand is described by the equation $p = a - bq$ where p is the price, q is the quantity, and a and b are positive parameters. The idea is that as the price increases, consumers would demand less of the product. The supply is described by the equation $p = kq$, where p is the price, q is the quantity, and k is a positive parameter. The idea is that as the price increases, the manufacturer would supply more quantities. We assume further that there is a delay as the supply reacts to changes. (For example, to manufacture goods takes some time.) The discrete time intervals is denoted as $n = 0, 1, \ldots$. We assume that the demand is described by the equation $p_n = a - bq_n$; that is, at time n, the quantity q_n of the product would be sold at price p_n. We assume that the supply is described by the equation $p_n = kq_{n+1}$ *(equation1)*;
   that is, one time unit is needed for the manufacturer to adjust the quantity q_{n+1}, at time $n+1$, to the price p_n, at prior time n.
   (1) use *equation 1* to find an recurrence relation for p_{n+1},
   (2) solve the recurrence relation in (1). (Hint: we do not consider initial conditions here.)
5. (15%)Draw the transition diagram of a finite-state automaton that accepts the set of strings over {0,1} that contain an even number of 0's and odd number of 1's. Is 0101010 accepted?

6. (15%)Find a maximum flow from *a* to *z* in the following network (beginning with the flow in which the flow in each edge is equal to zero.)

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*z*
a	0	6	0	0	8	0	0	4	0	0	0
b	0	0	8	0	0	0	0	0	0	0	0
c	0	0	0	10	0	0	1	0	0	0	0
d	0	0	0	0	0	0	0	0	0	0	8
e	0	3	2	0	0	3	0	0	14	0	0
f	0	0	0	0	0	0	10	0	12	0	0
g	0	0	0	9	0	0	0	0	0	0	0
h	0	0	0	0	0	0	0	0	10	0	0
i	0	0	0	0	0	0	0	0	0	6	0
j	0	0	0	0	0	0	10	0	0	0	12
z	0	0	0	0	0	0	0	0	0	0	0

7. (15%)Suppose the specifications for a database product state that the product must be able to handle any number of records from 1 through 16383 (2^{14}-1). In software engineering, if we are to test the database, one could classify the range of number of records into:

Class 1: Less than one record.

Class 2: From 1 through 16,383 records.

Class 3: More than 16383 records.

One then chooses to build records among the classes for test cases. Is this classification defines an equivalence relation? If your answer is yes, define such an equivalence relation and prove it. If your answer is false, please disprove it.