請依次序作答, 否則不予計分。

(10%) 1. In Hamming code, k parity bits are added to an n-bit data word, forming a new word of n+k bits. Those positions numbered as a power of 2 are reserved for the parity bits, the remaining bits are the data bits. Consider the 8-bit data word

Bit position	1	2	3	4	5	6	7	8
Data	1	1	0	0	0	1	0	0

(a) What is the length (i.e., n+k) of the above data with Hamming code?
(b) What is the new words?

(10%) 2. An urn contains 5 blue and 7 gray balls. Two are chosen at random, one after the other, without replacement. (a) What is the probability that the second ball is blue?
(b) If the experiment of choosing two balls from the urn were repeated many times over, what would be the expected value of the number of blue balls?

(15%) 3. Let G be the graph with vertices v1,v2 and v3 and with **A** as its adjacency matrix. Compute the matrix $\mathbf{A}^2$ and $\mathbf{A}^3$ and find the number of walks of length 2 from v1 to v3 and the number of walks of length 3 from v1 to v3. $\mathbf{A}=\begin{bmatrix}1 & 1 & 2\\ 1 & 0 & 1\\ 2 & 1 & 0\end{bmatrix}$.

(15%) 4. If k is a positive integer and T is a full binary tree with k internal vertices, then T has a total of (a) vertices and has (b) terminal vertices. (c) Prove it.

(10%) 5. Show the order for the sum of the first n integers.

(10%) 6. Find best- and worst-cast orders for the sequential search algorithm from among the set of power functions.

(10%) 7. Suppose two members of the group of twelve refuse to work in a team, how many five-person teams can be formed?

(10%) 8. Apply the modular equivalence rules to find 144^4 mod 713.

(10%) 9. In IPv4, a host ID may not consist of either all 0's or all 1's. The left-most 24 give the full network ID and the remaining 8 bits are used for individual host IDs. Also, the three left-most bits are set to 110.
(a) How many class C networks can there be?
(b) How many host IDs can there be for a Class C network?