Problem 1
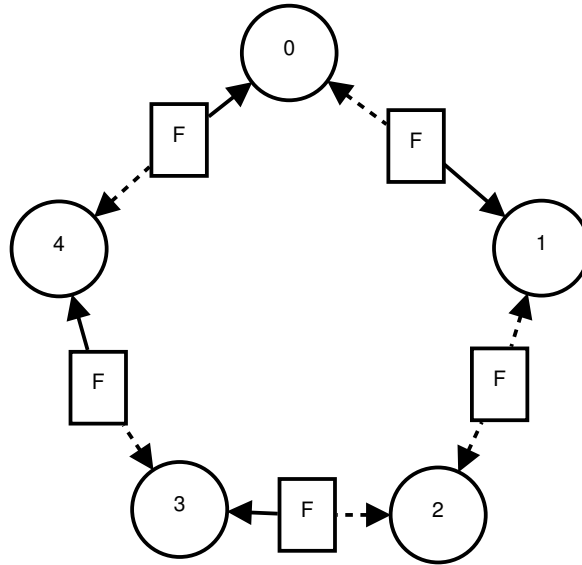

Problem 2

1. This system is safe.

   (a) P_3: 1 2 2, Available: 1 0 1

   (b) P_3: term, Available: 2 2 3

   (c) P_1: 4 2 3, Available: 0 1 0

   (d) P_1: term, Available: 4 3 3

   (e) P_0: 4 4 5, Available: 0 0 2

   (f) P_0: term, Available: 4 4 7

   (g) P_2: 4 4 6, Available: 0 0 2

   (h) P_2: term, Available: 4 4 8

2. This system is unsafe.

   (a) P_3: 1 2 2, Available: 1 0 1

   (b) P_3: term, Available: 2 2 3

   (c) P_1: 4 2 3, Available: 0 1 0

   (d) P_1: term, Available: 4 3 3

   (e) P_0: 4 4 2, Available: 0 0 2

   (f) P_0: term, Available: 4 4 4

   (g) Not enough resources to continue.

Problem 3

1. 1kB pages are 2^{10} Bytes large. There are 22 remaining bits in the address. Splitting that in half, both the outer and inner page table are 11 bits wide. Therefore, there are 2^{11} entries four bytes wide in the table, for a total of 8 kB per inner page table.

2. I don't quite understand what this question is asking. If it is asking for each inner page table to have the number of index bits rounded up to the nearest byte, then the inner page table would have 2^{16} four byte entries, or 128 kB.

Problem 4

This is an odd virus. If it had self duplication properties, it would be a worm, but it is not because it deletes itself after damaging the information on remote systems. This bug's only effect would be to break systems rather than exposing the information to the outside world. I would assume that this program was made to "punish" the company for getting rid of programmer X.

Problem 5

Symmetric key systems require key exchange to happen in secret, because the same key is used to encrypt and decrypt. Asymmetric key systems do not require secrecy for key exchange, different keys are used for encryption and decryption.

Problem 6

According to Paul Krzyzanowski in his *"Introduction to Distributed Systems"* lecture for Rutgers CS 417: "A tightly-coupled system is one where the components tend to be reliably connected in close proximity. It is characterized by short message delays, high bandwidth, and high total system reliability. A loosely-coupled system is one where the components tend to be distributed. Message delays tend to be longer and bandwidth tends to be lower than in closely-coupled systems. Reliability expectations are that individual components may fail without affecting the functionality of other components."