1. (10 points) Use Cramer's rule to solve the following system

$$4x_2 + 5x_3 = 3$$
$$2x_1 + 3x_2 = 8$$
$$6x_1 + 7x_3 = -1$$

2. $A = \begin{bmatrix} 1 & 7 & 5 \\ 3 & -1 & 1 \\ 2 & -2 & 0 \end{bmatrix}$

(a) (5 points) Find the inverse matrix of A.

(b) (10 points) Compute the LU factorization of the matrix A

3. $B = \begin{bmatrix} 3 & -2 & 1 \\ 1 & 0 & 7 \\ 0 & 0 & 2 \end{bmatrix}$

(a) (10 points) Find the eigenvalues of B and corresponding eigenvectors.

(b) (5 points) Determine $B^{50} * \begin{bmatrix} 4 \\ 2 \\ 0 \end{bmatrix}$

(c) (10 points) Find the geometric and algebraic multiplicities of each eigenvalue.

4. (10 points) Moore's law is an observation and named after Intel co-founder Gordon Moore in 1965. Give a brief description (around 50 English words) about Moore's law.

5. (10 points) There is a program running 10 seconds on computer A, which has a 2 GHz clock. If this program is executed on another computer B with 5 seconds, the computer B has 1.2 times as many cycles as computer A. What clock rate should be used in computer B?

6. (10 points) What is data hazard? What is the solution to data hazard?

7. (10 points) There is a processor with a base CPI (Cycles Per Instruction) of 1.0 and a clock rate 4 GHz. Assume that all references hits are in the primary cache, and a main memory access time is 10 ns (including all the missing handling). Suppose that the miss rate per instruction at the primary cache is 2%. How much faster will the processor be if we add a secondary cache which has a 5 ns access time for either a hit or a miss and is large enough to reduce the miss rate to main memory to 0.5%?

8. (10 points) Write the following abbreviations in full. For example, FSM: Finite State Machine.
   i. ALU
   ii. RISC
   iii. DRAM
   iv. GPU
   v. MIPS