This examination consists of 7 questions. The weight of each question is given following the question number. Attempt all questions. Please write your answers below the questions. No aids are permitted. Good luck!

1. (10) Use the Quine McCluskey method to simplify

\[ f = \overline{m7} + \overline{m8} + \overline{m14} + \overline{m15} + \overline{d0} + \overline{d2} + \overline{d5} + \overline{d10} + \overline{d13} \]
2.(10) Give the single precision IEEE floating point representation for the sum of 659.875 and 21.6875
3.(10) Partition the following state diagram so that s0, s1, s4 are in one partition and s2, s3, s5, s6 are in the other.
4.(10) Use the implication chart method to reduce the following state diagram.
5.(10) State variable C in the following state diagram is implemented with a negative edge triggered JK flip-flop. Give simplified equations for $J_C$ and $K_C$.
6.(20) Consider the simple 2-cycle computer discussed in class that used a single synchronous memory and executed LD, ST AD, and BN instructions.

a) Give a datapath for the computer.
b) Carefully define the control signals for the computer.
c) Give a state diagram for the computer.
7.(20) Design a controller that uses a 4-word ROM to implement the following state diagram. Give both the circuit and the content of the ROM.