

Student ID: _____

ICS 151

Quiz 5

Name : _____ , _____
(Last Name) (First Name)

Student ID : _____

Signature : _____

Instructions:

1. Please verify that your paper contains **5 pages** including this cover.
2. Write down your Student-Id on the top of each page of this quiz.
3. This exam is **closed book**. No notes or other materials are permitted.
4. Total credits of this quiz are **40 points**.
5. To receive credit you must show your work clearly.
6. **No re-grades will be entertained if you use a pencil.**
7. Calculators are **NOT** allowed.

Solution

Student ID: _____

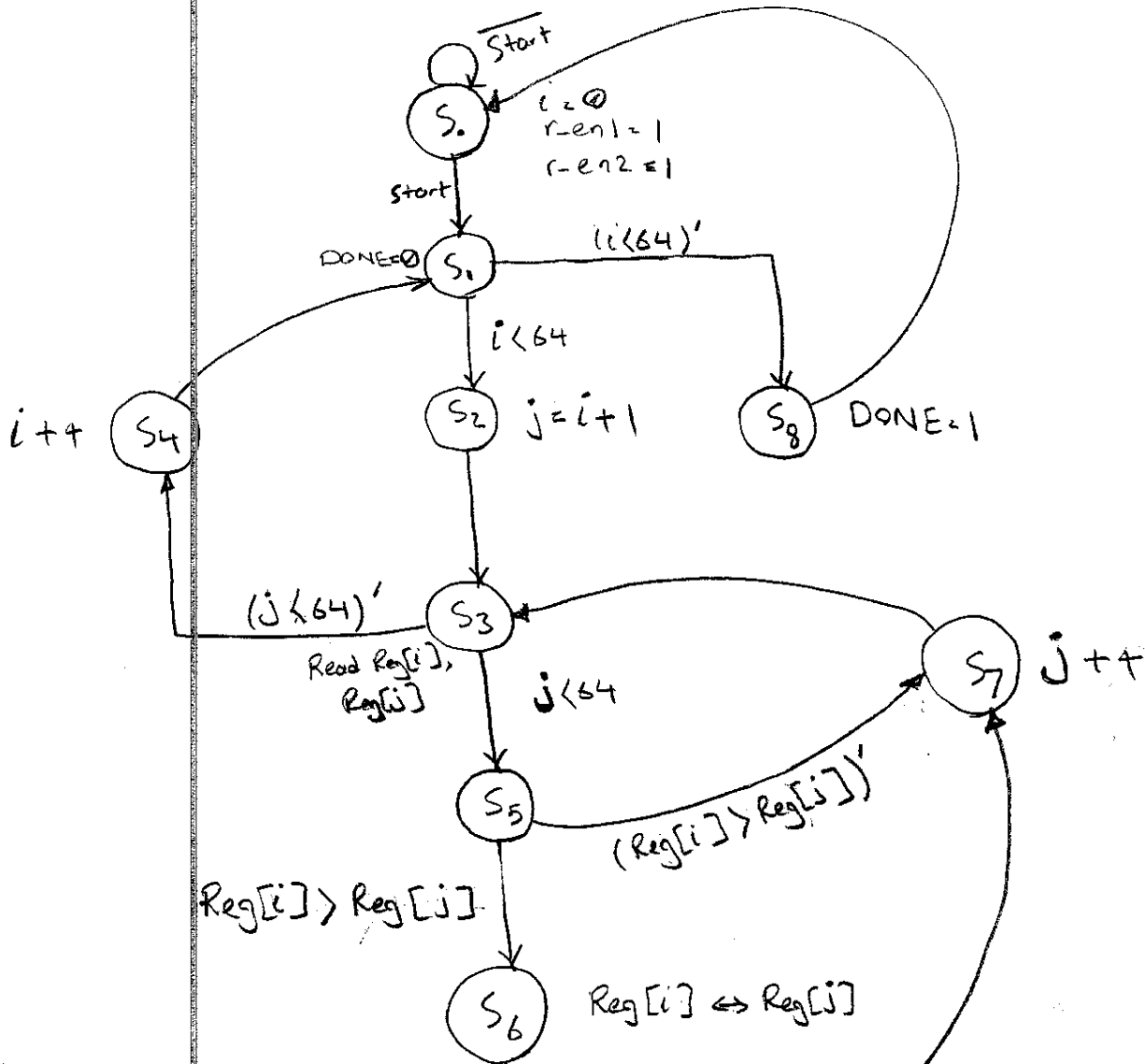
Q1: RTL design

[40 points]

Design a circuit that sort 64 32-bit unsigned numbers stored in a 32x64 register file in increasing order. The design begins operation when a signal **START** is set to "1" and asserts signal **DONE** when the operation is completed.

1. Capture a high-level state machine

[10 points]



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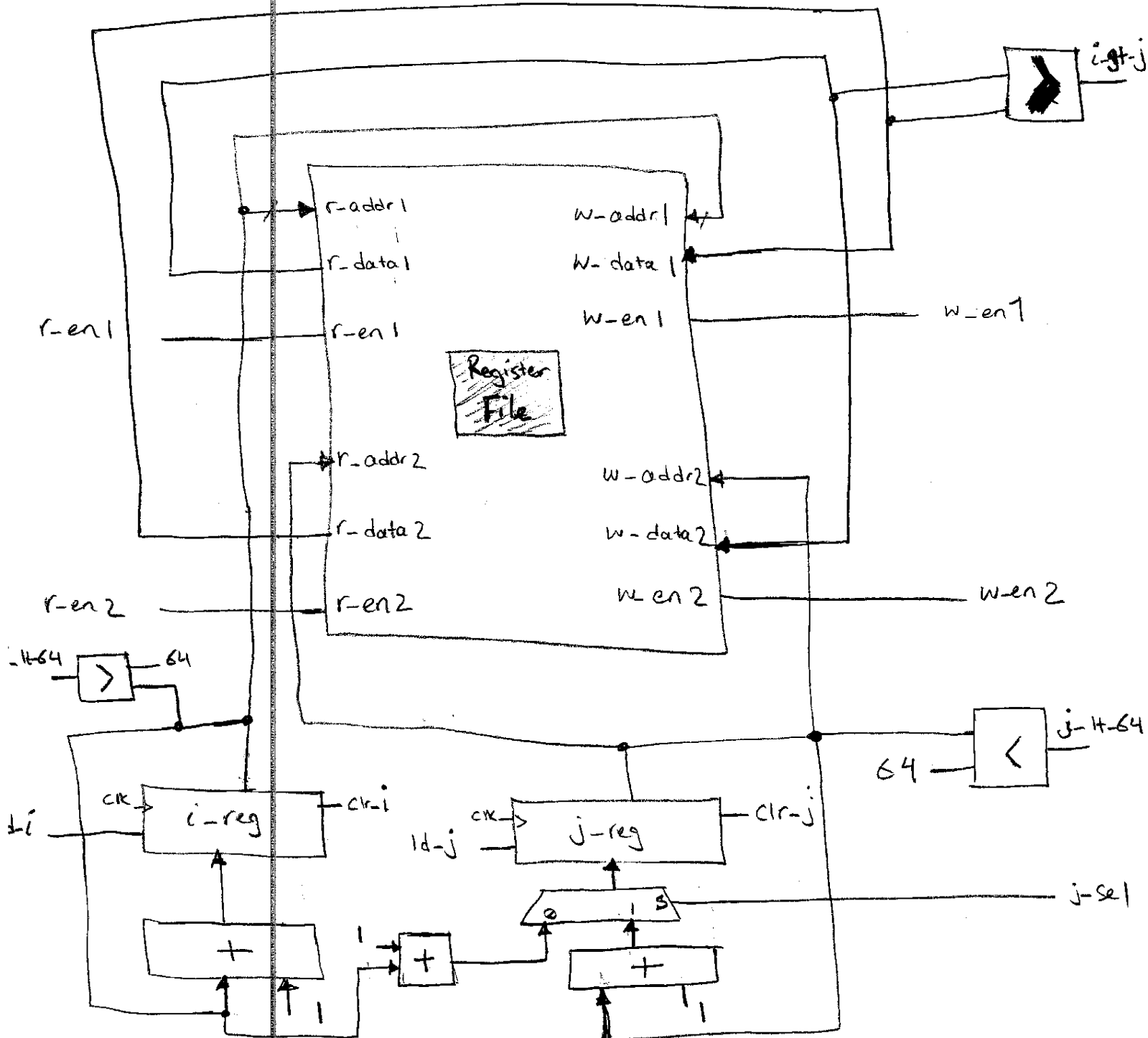
for (i=0; i < 64; i++)
    for (j=i+1; j < 64; j++)
        if (A[i] > A[j])
            A[i] <-> A[j]
    
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Student ID: _____

2. Create the datapath using the components (as many as needed) listed below:

- a. Register file (2 read port, 2 write port)
- b. Adder
- c. Comparator
- d. Register

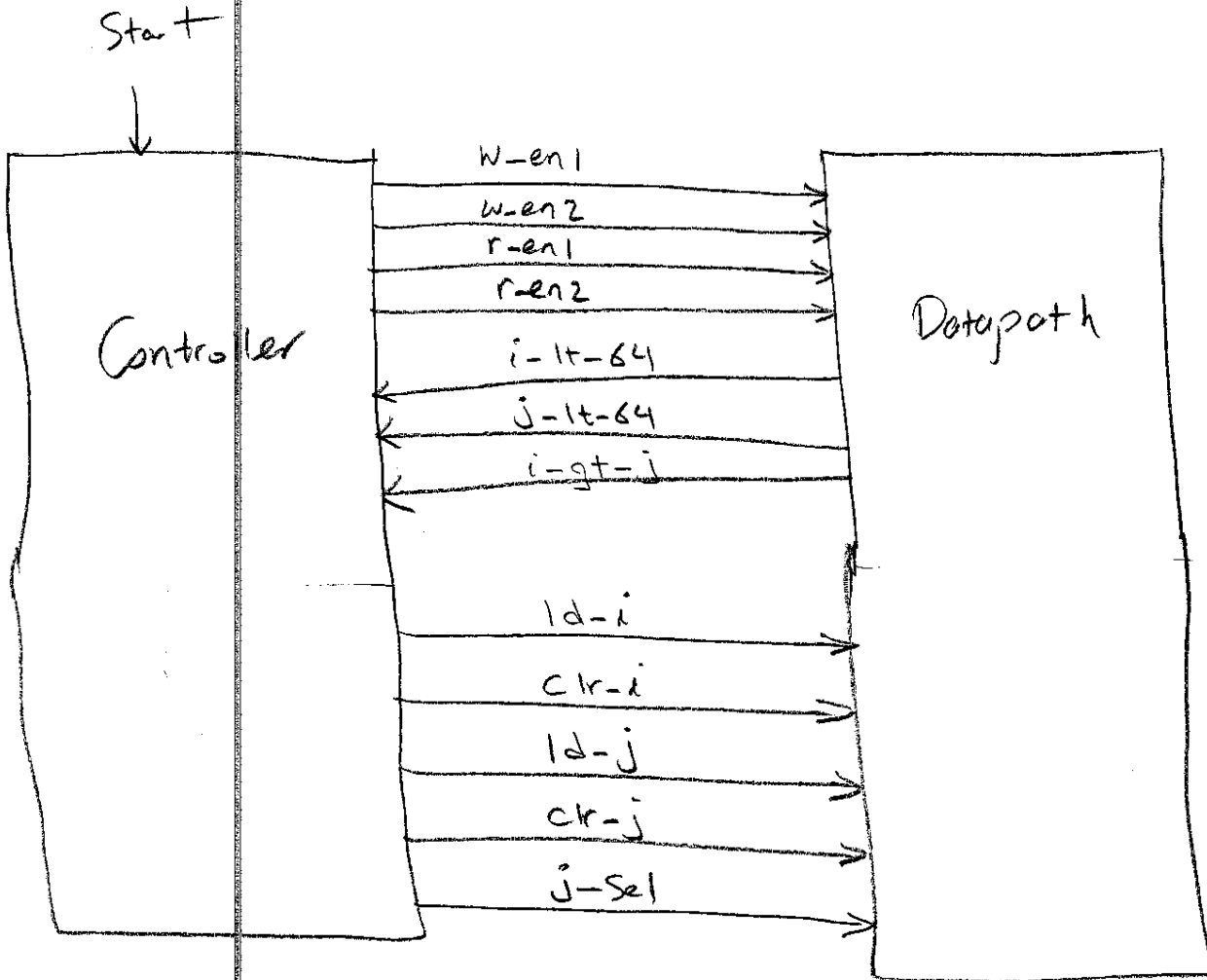
[10 points]



Student ID: _____

3. Connect the datapath to controller

[5 points]



Student ID: _____

4. Derive the controller's FSM diagram

[5 points]

