1. This exercise is meant to be started during the class meeting and completed individually outside class. **Please work in groups of two to four people.** (If you need help then let me know and I will assist.) List the members of your group below. Underline your name.

2. Briefly explain what the following C program does. In particular, clearly state and explain its output as precisely as possible.

```
1    #include <stdio.h>
2    #include <stdint.h>
3    #include <inttypes.h>
4    uint32_t f(uint32_t x, uint32_t y) {
5      if (y == 0) return 1;
6      else if (y == 1) return 2*x;
7      else return f(2*x, y-1);
8    }
9    int main() {
10     printf("%" PRIu32 "\n", f(3, 5));
11     return 0;
12   }
```

3. Provide a RV32M RISC-V Assembly Language program, assuming a RARS(M) environment, that corresponds to the program of Question 2 as closely as possible. Briefly explain the key portions of the program.

4. (a) Identify the instructions (one or more) of the assembly language program of Question 3 that correspond most closely to the subexpression `y - 1` on line 7 of the program of Question 2.

   (b) Provide *machine code* (in binary) for the instructions identified above, explaining your answer briefly.

5. Refer to Figure 4.11 of the textbook. Provide the values of each of the control signals in that figure for the instruction(s) of Question 4. Explain your answer.

6. Provide the machine code (text and data segments) corresponding to the program of Question 3. Produce the code by hand first, then compare with the results using RARS(M).

7. Depict the states of the relevant registers before and after the code of Question 6 is executed, as well as after half the iterations of the loop have been executed. Explain your answer.