Q1)

1. fibonacci(a1) = 1, if a1<=1

fibonacci(a1) = fibonacci(a1-1) + fibonacci(a1-2)

2) s0 and a0 is the register to store the result in the process, it store a0 into s0 register, and in the last step a0 hold the result while s0 hold the pre-used value(lw s0, 0(sp)).

3)The value should be smaller than when a1 is 13, if a1 = 2, a0 will be 1, if a1= 5, a0 will be 5.

4)S0 is saved by the callee as it store the result giving by instruction like li , lw and add.

5) line 8 and line 30. This two line is reserving memory space and releasing memory space for stack pointer. Line 9-11 is storing s0,s1,ra into stack pointer, while line 27 -29 is loading word back into s0,s1 and ra.

Q2)

1)  
 00001111  
 x 00001101  
-----------------

00001111

00000000

00111100

01111000

00000000

00000000

00000000

00000000

------------------

11000011

1. multiplicand:1111

ALU:0000

product:0 00001101

multiplicand:1111

ALU:1111+0000

product:0 01111110

multiplicand:1111

ALU:0111+0000

product:0 00111111

multiplicand:1111

ALU:0011+1111=10010

product:0 10010111

multiplicand:1111

ALU:1001+1111=11000

product:0 11000011

product = 11000011

Q3)

1)

Sign bit = 1

0.625x2 =1.25 1

0.25x2 =0.5 0

0.5x2 =1 1

0.625 = 0.101

Exponent =2^-1 =127-1=126 = 01111110

IEEE754 = 1 01111110 01000000000000000000000

2)

3EC00000=0 01111101 10000000000000000000000

Sign bit= 0

Exponent =01111101 = 125 =127 -2

Ans=0.0110 =(1x2^-2)+(1 x2^-2)=0.375

1. 32bit in total and 1bit for signed bit. Minimum exponent value is 00000001 where is -126

Minimum value is 1.0x2^-126 , and maximum exponent is 11111111 where +127 =1.1111111111111111111x2^127

So the range is 1.0x2^-126 to 1.11111111111111111111x2^127

Which is 1.18×10−38 to 3.4×10^38

Q4)

1) PC stand for program counter.it is a register in CPU that contains the address of the next instruction. When a instruction is executed during fetch-execute cycle, the pc will automatically increased and points to the memory address of next instruction.

2) fetch, decode and execution are three most important steps in the control of a processor. Instruction will be fetch from the PC, after that the instruction will be decode ,for example, the processor reads the opcode field of the instruction and will be executed in the end.

Q5)

1)

funct7 :0100000

rs2:00010

rs1:00001

funct3:101

rd:00011

opcode: 0110011

rd = rs1 \* rs2

mulu rd, rs1, rs2

2)

rd: Write register address port

rs1: read register address port 1

rs2: read register address port 1

3)  
Add: it take the address from PC and add 4 into it and return to PC, it is for updating upcoming instruction address from PC.

Instruction Memory: it read the whose machine code and decode it for the machine to use like separate funct7,rs2,rs1,funct3,rd,opcode.

ALU: it read the data 1 and data from ALUSrc and do the mathematic operation like shifting bit and adding bit.