1. Explain the Datapath flow for the three different instruction classes.

* R-Format
  + Instruction Read from IM
  + Values from two registers are read and put into ALU
  + ALU does the operation and writes result to register
* Load Word
  + Instruction is read from IM
  + The address stored in register needs to be determined using the register file module
  + The value of the register is taken from the register file and put into the ALU for offset
  + The output of the ALU is put into the memory unit
  + The output of the memory unit (what was in memory at that address) is put into the register file module to be written to a register
* Store Word
  + The instruction is read from IM
  + The address is determined from the register file
  + The offset of this address is added using the ALU
  + This address, as well as the data in the other register provided to the instruction are given to the memory module
  + The value of the register is written into that memory address using the memory module.
* Branch
  + Instruction is read from IM
  + Values from the registers are put into ALU
    - the first value is subtracted from the second
  + the control unit has special behavior if the result of the operation is 0
    - The immediate address is multipled by 4
    - This value is taken and added to the PC
    - This is taken and then written back to the PC

1. Write all the functional blocks required in the single-cycle Implementation of a microprocessor.

* Program Counter
  + An adder in combination with this
* Instruction Memory
* Register File
* ALU

1. Will Increasing the number of instructions change the architecture? Will the number of control lines from the control unit change? Explain.

Depending on the instruction added, the number of control lines would change. For instance if you add additional arithmetic operations, you would need to add more lines to the function selector for the ALU. An instruction that allowed for performing arithmetic operations on data both in a register and in memory would require an additional mux, and thus an additional control line to control this mux.