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**YOUR Group Details:**

**Justification of YOUR Circuitry Diagram Design:**

(**NOTE**: No more than 300 words)

There are 3 inputs: inM[16], Instruction[16] and Reset. There are 4 outputs: outM[16], address[15], writeM and PC[15]. The first Mux16 determines whether it is A-instruction or C-instruction. The selector bit is instruction[15], if it is 1 then instruction is passed and it is C-instruction, but, if it is 0 then false is passed which is A-instruction.

Given that it is C-instruction, the instruction will follow the C-instruction layout. WriteM is one of the destination bits in the C-instruction.

For A-Register, the input is either instruction or aluOut. The load bit is the MSB which is fed into a not gate then into a Or gate with Destination A, this is done because if the MSB is 1 then it needs to be converted to 0 for A-instruction. The output is both fed to the PC and first 14 output bits is addressM output. Next is the D-Register, where the input is output of ALU and the load is from the Destination-D bit.

The ALU, the inputs are “x” and “y” and 6 computation functions. There is one output and 2 status flags “ng” and “zr”. Input ‘x’ is from the output of the D-register and input ‘y’ is from determined from either inM or output of A-register through a Mux16 with controlAM as the selector bit. The 6 computation functions are from the 6 control bits from the C-instruction. The output is also equivalent to outM.

For Program Counter, the input is aRegOut, load is from a series of jump functions. For C-instruction, the jump functions are utilised, otherwise the PC will be incremented. Jump indicates the continuation of execution with instruction addressed by the A-Register and it depends on the ALU output values. The reset bit is also fed into the PC. The output is PC[15].