October 31, 2016

Session 2015

Design and implement a 4-bit arithmetic and logic unit (ALU) with a 2-bit address bus. The ALU should be able to perform the operations of addition, subtraction, logical left shift and XOR of the two 4-bit input numbers at the instruction addresses of 00, 01, 10 and 11 respectively. The ALU should accept two 4-bit numbers as its input and output a 4-bit number as the result of operation performed. The ALU should also accept a 'carry in bit' and output a 'carry out bit', an 'overflow bit' and a 'zero bit' (a bit that goes high when output is equal to zero).
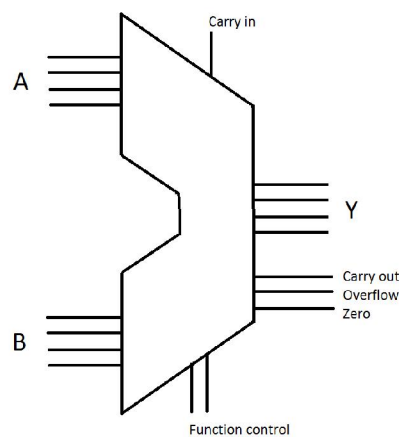
Instructions regarding project:

- Make the project using cascaded breadboards and jumper wires. (No need for PCB or Vero board)
- Use jumpers with male connectors at their terminals. Use separate colors for implementation of the hardware of every function. Patch the circuit neatly.
- The inputs should be given using 2 state switches (you can get these from market). And the outputs should be presented on LED's.
- Additional marks will be given to the students who will display inputs and outputs (for the addition and subtraction) on seven segment display units.

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Instructions regarding grading:

- Project is to be submitted in the form of a group of 2 or 3 students.
- Project is compulsory for all students. Each student should be a part of at least and at most one group.
- Please submit your group roll numbers to the respective class representatives.
- Project carries 15% marks of the lab session (1 credit hour).
- Partially running projects will be accepted as well and graded accordingly.
- Project has to be submitted in the respective lab sessions of the week starting from 7th November to 11th November.
- A one page clear well drawn circuit diagram (using block diagrams where necessary) has to be submitted along with the project.
- For any help you can visit me in office hours or discuss in your respective lab sessions.

Apparatus:

- Use SN54LS283 or SN74LS283 4-bit binary adder IC. Make a habit of going through the data sheet of IC before using it.
- Use 4 to 1 multiplexers as many as required. But focus on using minimum possible no. of IC's
- No gates are required for shifter implementation.
- For zero bit output, do not use magnitude comparator circuit.
- You can make your own 5V power supply using a laptop charger (9-18V DC) and a 7805 regulator IC. Do not use two or more 7805 IC's in parallel. Use a heat sink with 7805 IC. I would recommend using a fuse for protection (see the current rating of your charger) since any short circuit in your hardware will damage your charger. Do not use mobile phone charger/ USB chargers as a supply, they do not have enough current rating.

Digital Systems Laboratory

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