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The experiment aims to study the working of the 4-bit adder/subtractor using the IC7483 integrated circuit.100%(3)100% found this document useful (3 votes)10K views5 pagesThe document describes the design and implementation of a 4-bit binary adder/subtractor using the IC7483 integrated circuit. The circuit requires an IC7483, OR gate, AND gate, and connecting… If you've ever wanted to learn more about circuit diagrams and how they can help you understand the most complicated electronics projects, then this article about circuit diagram of 4 bit adder-subtractor using IC 7483 is for you!Adding and subtracting binary numbers is a vital skill for anyone interested in working with microcontrollers, and there are few better ways to get started than understanding the fundamentals of circuit diagrams. The 4 bit adder-subtractor circuit diagram using IC 7483 is one of the most popular and commonly used diagrams, as it provides a simple yet effective way to learn the basics.At the core of the 4 bit adder-subtractor circuit diagram using IC 7483 is the 7483 integrated circuit. This chip contains two 4-bit full adder circuits that can be used to do calculations, such as adding and subtracting two 4-bit binary numbers. The inputs to this circuit are two 4-bit binary numbers and a mode control pin. Depending on whether the control pin is connected to ground or Vcc, the two 4-bit binary numbers can be added or subtracted.In addition to the basic adder-subtractor circuit, there are several other components that make up the 4 bit adder-subtractor circuit diagram using IC 7483. These components include the power supply, voltage regulator, resistors, capacitors, and transistors. Together, these components help to ensure that the circuit performs accurately and efficiently.Now that you understand the basics of the 4 bit adder-subtractor circuit diagram using IC 7483, you can start to explore its many uses. Whether you're looking to understand the fundamentals of binary math or simply want to learn more about circuit diagrams in general, this diagram is an excellent starting point. With a few modifications, the 7483 circuit can even be used to build larger, more complex circuits. So if you're just getting your feet wet in the world of microcontrollers, the 4 bit adder-subtractor circuit diagram using IC 7483 is a great place to start. Design a 4-bit binary adder and subtractor using the 7483 IC. Learn how to modify an adder to function as a subtractor using 2's complement. Build and test the circuit for both addition and subtraction of 4-bit numbers. Analyze the circuit outputs, including carry and borrow results. Use the circuit as a comparator to determine if one number is greater than, equal to, or less than another. Component/DeviceDescriptionQuantity 7400 Quad 2-Input NAND × 1 7402 Quad 2-Input NOR × 1 7404 Hex Inverter × 1 7408 Quad 2-Input AND × 1 7432 Quad 2-Input OR × 1 7483 4-Bit Binary Full Adder × 1 7486 Quad 2-Input XOR × 1 Experiments Every experiment section that requires you to build a circuit and test it has an asterisk (*). For those sections: For the in-class lab: Demonstrate the working circuit to your lab instructor. For online lab: Take a video to describe your circuit, upload the video to YouTube, and put the link in the report. Do not unplug your Adder/Subtractor circuit, you will still need it for this experiment. The circuit of Exp #8.2, configured as a subtractor, can be used to compare two 4-bit numbers. Subtractor outputs Cout and (S3…S0) can be combined logically to indicate the relationship between inputs A and B. The gate circuit needed to do this appears as the interface block in the following diagram. Figure 8.2: 4-bit Comparator Design the contents of this interface. You will build the circuit using only 2 chips: a 7402 NOR chip either a 7432 OR chip or a 7408 AND chip. Design the interface in two ways: (a) an OR and NOR circuit, and (b), a NOR and AND circuit. Include both designs in your lab journal and build and test one of them. Each design consists of 3 parts — one for each output — and requires 5 gates total. KiCad has custom DM symbols for all gates (including ANDs and ORs). Use them, but only where they make circuit logic easy to follow (i.e. where bubbles cancel). For each design: Start by drawing the circuit to generate "A = B". This output is true only when A - B = 0; i.e. only when (S3…S0) = 0000. Therefore, for this part of the interface block, you must combine inputs S3…S0 using gates so that output "A = B" goes high when S3…S0 are all low. A 4-input NOR would be the perfect solution — if one were available. Instead, you will have to do the design with the gates assigned. Next, draw the circuit to generate output "A < B". This output is true if a borrow results when subtracting B from A. With a true subtractor, you would just connect "A < B" to the borrow bit. However, the "subtractor" used here is really a 2's-complement adder, so it produces a carry-out instead of borrowing. Therefore you must use the relationship between carry-out and borrowing observed in Section 8.2 Finally, draw the circuit for "A > B". This output goes high when the other two are low, since "A > B" is true only when "A = B" and "A < B" are both false. Again: use DeMorgan gate symbols wherever they contribute to making circuit logic clear. Question Implement your design in hardware based on your group number..$Group\# = \left\{ {\matrix{{Odd} & { \Rightarrow {\rm{Build\;NOR + OR\;circuit}}\,} \cr{Even} & { \Rightarrow {\rm{Build\;NOR + AND\;circuit}}} \cr} } \right.$Build the circuit and connect it to the subtractor outputs, then test it for these three cases:A = B, A < B, and A > B. (You pick A and B values from Exp #8.2 Table 8-2). Demonstrate your results to your instructor.In your lab report, present a clear discussion of the following based on your lab results: If (A = B), what are subtractor outputs S3…S0, and C4? Explain why output "A = B" goes high. If (A < B), what are S3…S0, and C4? Explain why output "A < B" goes high. If (A > B), what are S3…S0, and C4? Explain why output "A > B" goes high. Reminder: Refer to the section in case you get stuck trying to debug your circuit. by eees.in · Published October 3, 2021 · Updated October 5, 2021 FOUR BIT ADDER/ SUBTRACTOR USING 7483 AIM: To set up a 4 bit adder/subtractor circuit using 7483. MATERIALS AND TOOLS REQUIRED: Digital IC Trainer kit, IC 7483, 7486, power supply. THEORY: 7483 is a TTL IC with 4 full adders in it. This means that it can add two 4 bit numbers. In a 4 bit adder A3A2A1A0 and B3B2B1B0 are the inputs and Cout and S3S2S1S0 are the outputs. CARRYIN pin is grounded for 4 bit adder. This is also called a nibble adder. Circuit Diagram: PROCEDURE: The circuit is set up. The inputs are applied and SUB is set to zero. The added output is noted. Then SUB is set to one. And again inputs are applied and outputs are noted. Observations are tabulated. RESULT: A 4 bit adder/subtractor circuit using 7483 IC is set up. 2. Experiment no. 4 Objective : To study adder subtractor using IC 7483 Apparatus Required : IC 7483 , Multimeter Power supply (5V) DC IC 7486 (X-OR gate), Connecting wires, and LED breadboard. Contents Theory • What are logic gates? • Half and full adder/ subtractor • IC 7483& pin configuration • 4- bit binary addition/ subtraction • Controlled inverter • Designing of 5V power supply • Timing Diagram & Propogation Delay Observation Result & Precautions Applications , Advantages & Disadvantages Viva Questions Summary Refrence 3. What are logic gates ? • A logic gates is an electronic device that acts as a building block for digital circuits. • They perform basic logical functions that are fundamental to digital circuits. 4. X-OR gate In EX-OR gate the output will be high (1) when both input are different and output will be low (0) when both the input are equal IC used: IC 7486 (XOR) why exor gate is used for half adders? They can provide a "carry-bit" function or as a controlled inverter, where one input passes the binary data and the other input is supplied with a control signal. 5. Half Adder • It adds two single binary digit A and B. it has two output: sum(s) and carry (c). • A half adder is a combinational circuit that consist of 1 EX-OR gate and 1 AND gate . Half adder is used to add two bit binary digit. 6. Full Adder A full adder is a combinatinal circuit that performs the arithmetic sum of three inputs and carry and sum as its output. • It consist of 2 Ex-OR gates , 2 AND gates and 1 OR gate. 8. • IC used : IC 7486 (XOR), IC 7408 (And), IC 7432 (OR) gates. 9. Half subtractor Half subtractor is used to subtract two bit binary digit. It subtract two single binary digit A and B. it has two output: difference (d) and borrow(b). A half subtractor is a combinational circuit that consist of 1 EX-OR gate ,1 AND gate and 1 NOT gate. 10. Full subtractor It consist of 2 EX-OR gates,2 NOT gates, 2 AND gates and 1 OR gate. Three inputs are feeded say (A,B,Bin) producing two outputs Difference and Bout. IC used : IC 7486 (XOR), IC 7408 (And), IC 7432 (OR), IC 7404 (NOT) gates. 12. IC 7483 What is IC? An integrated circuit (IC), sometimes called a chip, microchip or microelectronic circuit,is a semiconductor wafer on which thousands or millions of tiny resistors, capacitors, diodes and transistors are fabricated. IC 7483- IC 7483 is a 4 bit parallel adder/ subtractor. This means that it can add /subtract two 4 bit numbers . It consists of four interconnected full adders along with the look ahead carry circuit. 13. Ic 74ls83 pin configuration The following figure shows the physical appearance of the IC is shown below. It is a 16 pin IC and available in multiple packages. The pinout diagram of 74LS83 IC is given below: 14. 4-bit Binary Addition Decimal Binary Addition Addition 12 1100 + 7 + 0111 ------- ---------- 19 10011 For example ,here in this Fig. ctr =0 and hence Cin=0 . Since the input is low the xor gate will produce the output as such i.e. B3B2B2B1B0 and when it added with i/p A3A2A1A0 and Cin(Cin=0) it results in the sum S3S2S1S0 of 4-bit binary numbers. 15. 4-bit Binary subtraction Decimal Subtraction Binary Subtraction 12 1100 - 7 - 0111 -------- ---------- 5 0101 For example ,here in this Fig. ctr =0 and hence Cin=0 . Since the input is high the xor gate will produce the complemented output of B3B2B1B0 and when it added with i/p A3A2A1A0 and Cin(Cin=1) it results the o/p as difference of two 4-bit binary numbers i.e D3D2D1D0 . No EAC 16. A controlled inverter is neded when an adder is used as a subtractor. " Subtraction is nothing but the addition of 2's complement of the subtrahend to the minued". When the control input bit is low it is passed as such to the output. When the control input bit is high the output is the 1's compliment of the input. Similar to the truth table of an EX-OR Gate. 17. Circuit Diagram of IC 7483 as 4- bit parallel adder/ subtractor 18. Designing of 5v power supply Materials Required 20. Cout S4 S3 S2 S1 Cin Gnd 5V A4 A3 A2 A1 B4 B3 B2 B1 16 15 14 13 12 11 10 9 1 2 3 4 5 6 7 8 +5V power supply connection & binary calculator 1001 0110 0011 21. Timing Diagram of Full Adder 22. propagation delay The time required to change the output from one logic state to another logic state after input is applied, is called the propagation delay of logic circuit. Propogation delay of sum and carry in full adder Carry propagation delay of a full adder is the time taken by it to produce the output carry bit. Cout=AB+(A⊕B)Cin Propogation delay(t)= 2(pd of and) +1(pd of or)+1(pd of exor) =2(80ps)+1(90ps)+1(3ns) =3.250ns Sum propagation delay of a full adder is the time taken by it to produce the output sum bit. S=A⊕B⊕Cin Propogation delay(t)= 2(pd of xor) = 2(3ns) = 6ns 24. Result: • IC 7483 act as a 4-bit parallel adder and subtractor. • It act as a adder when control i/p is zero (low) and as a subtractor when control i/p is one (high) that is verified with the help of Truth Table. Precautions: 1. Verify the gates. 2. Make the connections as per the circuit diagram. 3. Note down the readings properly for adder and subtractor 4. Connections should be tight and led should work properly. 5. All IC must be check before starting the experiment. 6. Input power supply should be +5V only not more or less as IC 7483 work properly only at +5V. 25. Applications: Arithmetic unit implementation Binary and Digital Counters Digital logic design projects Alarms and digital clocks Calculator Circuit and Matrix Keyboard Advantage Of Parallel Adder Computation is fast. Bits are added simultaneously. They are economical. Disadvantage The major drawback of this Adder is the Propagation Delay. The delay is directly proportional to the length of binary numbers that are to be added. 26. Viva Questions: Q? What is the name of IC 7483? Q? How many outputs are there in IC 7483? Q? Where is parallel adder used? Q? How many pins are there in IC 7483? Q? Which IC is used for X-OR gate? Q? How many full adders are required for 8- bit binary number ? Q? Perform Binary Subtraction: 101000-010110 28. Refrence: 1. Digital Electronics Principles, Devices and Applications by Anil. K. Miani 2. Wikipedia sources & www.google images 3. in.youtube.com The circuit diagram for a 4-bit binary adder using IC 7483 is a crucial element of digital circuitry. This type of adder uses an integrated circuit (IC) to add two binary numbers, resulting in a sum output. It is used in a variety of digital devices, from calculators to computers. In this article, we'll discuss the basics of the circuit diagram and how it works.The 4-bit binary adder IC 7483 is a 14-pin device that consists of four full adders, each with two inputs (A and B) and one output (C). The inputs are connected to the two binary numbers that we want to add together, while the output is the sum of the two numbers. The IC contains two clock inputs, which, when triggered, will cause the adder to calculate the sum of the two numbers.When the IC is triggered, it will first evaluate the A and B inputs, and then determine the output. Each full adder can take two bits at a time, and produce one bit of output based on the input values. If both A and B are 1, then the output will be 0, whereas if only one of the inputs is 1, then the output will be 1.The resulting output is fed into a carry bit, which is used to store the result of the addition. The carry bit is then used in the next operation, allowing the IC to add multiple binary numbers together.The circuit diagram for the 4-bit binary adder using IC 7483 consists of several components, including the IC itself and various logic gates. The logic gates are responsible for determining the output of the adder. For example, an AND gate is used to determine if both A and B are 1, while an OR gate is used to determine if either A or B is 1.While the circuit diagram may look complicated, understanding how it works is relatively straightforward. By understanding how the logic gates work, you will be able to create your own digital circuits and build more complex devices.In summary, the 4-bit binary adder using IC 7483 is a useful tool for adding two binary numbers together. It is used in a variety of digital devices, from calculators to computers. By understanding the circuit diagram for the adder, you will be able to create your own digital circuits to build more complex devices.

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