

DIGITAL CIRCUIT DESIGN MINI CONFERENCE

ELE202 Digital Circuit Design Laboratory

Cherry Auditorium, Kirk Engineering Building, December 4, 6 & 9, 2002
Department of Electrical & Computer Engineering, University of Rhode Island

Session I. Wednesday (Dec. 4) 8:00-8:50 am

- 8:00 - 8:07. Home Security System
Josh Holt, Nara Nonnapha, William Villegas
- 8:08 - 8:15.
Stephen Furlani
- 8:16 - 8:23. Number Guessing Game
Chris Ross, Dan White
- 8:24 - 8:31. Odds and Evens
Russell Lancey, Pete DiSalvo
- 8:32 - 8:39. A Simple Lock
Sokha Saing, Oscar Sena
- 8:40 - 8:47. HI HO!
Valerie Zdun, Gabrielle Murphy, James Finneran

Session II. Wednesday (Dec. 4) 9:00-9:50 am

- 9:00 - 9:07.
Morgan Paxhia, Bill Farrell
- 9:08 - 9:15. Home Security System
John DiCecco
- 9:16 - 9:23
- 9:24 - 9:31. Car Alarm System
Dan Sarro, Staci Wasserman
- 9:32 - 9:39 4-Bit Code Electronic Lock
Ngu Vo
- 9:40 - 9:47.

Session III. Friday (Dec. 6) 8:00-8:50 am

- 8:00 - 8:07. Traffic Signals
Matt Auger, Jeb McCluskey
- 8:08 - 8:15. Scoreboard for Air Hockey Table
Brian Ascoli
- 8:16 - 8:23. Time Bomb Detonator
Kevin Hart
- 8:24 - 8:31. Stoplight
Ruben Rey, Michael Doucette
- 8:32 - 8:39.
- 8:40 - 8:47. Pseudo Slot-Machine
Nathan Burnell, Kathleen Cooper

Session IV. Friday (Dec. 6) 9:00-9:50 am

- 9:00 - 9:07. Database Search Simulation
Michael Corsi, Christina Drake, Kimberly Peloquin

- 9:08 - 9:15. 4-Way Intersection Traffic Light
Brad Lage, Erik Hanley, Rico dosSantos

- 9:16 - 9:23.

Tany Boulay, Jassica Logan

- 9:24 - 9:31. Four Way Intersection

Jake Bazirgan, Joe Durand

- 9:32 - 9:39. Hazards Plus

Daniel Carrigg

- 9:40 - 9:47. Customizable Light Display

Harlan Stern, Lou Zell

Session V. Monday (Dec. 9) 8:00-8:50 am

- 8:00 - 8:07. Traffic Lights Controller

Lao Vang, Sareh Rajae

- 8:08 - 8:15. Alarm System

Gulshan Arora, Rajesh Ramsingh

- 8:16 - 8:23. Electronic Lock

Shyla Booker

- 8:24 - 8:31. Digital Lock

Kevin McDonough

- 8:32 - 8:39. Electronic Lock

Jonathan Barlow

- 8:40 - 8:47. Time Bomb

Thomas Harrington, Frank Burea, Enrique Blanco

Session VI. Monday (Dec. 9) 9:00-9:50 am

- 9:00 - 9:07. Code Breaker

Gary Comtois, Brent Marsden

- 9:08 - 9:15. Sensational Christmas LEDs

Evelina Ruskowski, Brian Lavoie, Scott Sullivan

- 9:16 - 9:23. Frequency Checker

Nate Walker, Kyle Sutherland

- 9:24 - 9:31. Alarm Clock

Jennifer Rochira

- 9:32 - 9:39. Whack a Mole

Greg Fellow

- 9:40 - 9:47. Ethernet Cable Tester

Steven Merluzzo, Tim Parys

1

Home Security System with programmable pass code

Josh Holt, Nara Nonnapha, and Wilson Villegas.
Department of Electrical and Computer Engineering,
University of Rhode Island

For the project, we decided to build a decent low cost security home alarm system with programmable pass code. We have 3 infrared sensors set up and if one of them is triggered, it'll set the alarm to go off. in order to shut it off, we put in our code. in addition this code can be changed. our security system consists of three parts. first part consists of 4 BCD counters, 4 BCD-7 segment displays, a 4 bit DIP switch. the switch will control the numbers displayed on each 7 segment display. (0 and 1) the second part is actually the main alarm. this part consists of a 2-input NAND gate, 3-input NAND gate, and LEDs. this part will be connected to first part.(the BCD counter) the last part is the code where we have to put in the right code to shut off the alarm. this part isn't done yet but we think we will be working on a dual J-K flip flop with set and reset.

3

Number Guessing Game

Chris Ross and Dan White. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston RI.

In our final project, we designed a game where the user will input a number between 0 and 9. Once the user has entered their number using switches, the number will be displayed on a seven segment LED on the bottom of the board. On the other side of the board we have a clock which is at 16 Hz, which powers a BCD up/down counter. The value from the BCD up/down counter is then displayed on a different BCD to 7 segment display. This value is the generated value which you have to try to guess. After your selection has been made, you flip a switch on the counter side of the proto board and that turns the counter on. To stop it just flip the switch again. Obviously you could just compare the two numbers and see if you guessed the right number, but that would be too easy. So we have taken chip 4077, which is a quad 2 input XNOR chip which will compare each bit from user input number, and the bits from the BCD counter generated number. The values from the XNOR chips are then put into chip 4082, which is a Quad input AND gate. The value from this is then sent one to a green LED, and the other signal goes through a inverter, then to a red LED. If the two numbers are the same, then each XNOR gate will have the value 1. which then put into the and gate will output the value 1, sending a value of 1 to the green LED and a value of 0 to the red LED, with the opposite happening if the two values are different. There is

also going to be a switch to turn off the LED's while the numbers are generating.

4

Odds and Evens

Russell Lancey and Pete DiSalvo.
Dept. of Electrical and Computer Engineering,
University of Rhode Island, Kingston, RI

Odds and Evens is a game designed to take advantage of sequential logic, flip flops, push buttons and the seven segment display. The seven segment display will quickly count through and display numbers 0 through 9. It is the users responsibility to stop the count. Upon stopping the count the game user has 1 second to determine whether the number being displayed is odd or even. On the protoboard, there are three buttons. One to start and stop the count on the seven segment display, the second to represent an even number and the third to represent an odd number. If your answer is correct, a green LED will illuminate, otherwise the red LED will illuminate.

5

A Simple Lock

Sokha Saing, Oscar Sena. Department of Electrical and Computer Engineering, University of Rhode Island

We decided create a electronic lock. The chips that we will be most likly be using are Gates:AND, OR, NOR, NAND, XOR, XAND; Chips:BCD to 7-Segment,7-Segment Display, DIP Switches, and Memory Chip 14580. Our goal is to use a 4-bit number as the password. The user will be able to set the password, and lock the lock.the password can only be changed when the lock is in its unlock state.

6

HI HO!

Valerie Zdun, Gabrielle Murphy and James Finneran.
Department of Electrical Engineering, University of Rhode Island, Kingston, RI

For our project we developed a scrolling display of "HI HO" using four 7-segment LED displays. We also developed a 3-bit five counter and a 3-bit three counter using an X-input as a toggle between the counters. We created the counter using a number of AND and OR gates as well as three D flip-flops. From our 3-bit counter we then used simple logic to control each of our four LED displays. The 3-count will run them through a series of nothing, "HI", "HI HO." While our 5-count runs through the series of nothing, "H", "HI", "HI H", and finally "HI HO."

8

Home Security System

John DiCecco, Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

The home security system I have designed and prototyped has many of the features associated with contemporary systems, including pass-code activation, LED function and status indicators, multiple points of attachment for items such as motion sensors, as well as an anti-tampering feature that will trigger the alarm if the pass-code is entered incorrectly. (This can be set from 1 to 3 invalid entries decided by the homeowner.) The security code feature allows the homeowner to choose a pass-code, or PIN (personal identification number). When a number is entered to either arm or disarm the system, that number is sent and stored in a dual D Flip Flop. (For simplification and display purposes, these are represented as a single decimal digit, however, for practical purposes the code can be easily expanded.) Once the operator confirms the number and presses "enter", executed by the system clock and a debounce switch, the numbers are sent to a 4-bit comparator. If the numbers are the same, the system activates the "armed" mode if the system was previously in "disarmed" mode. (The converse also being true.) This "toggle" feature is handled by a JK Flip Flop, where the J and K inputs have been set to "1". The anti-tampering device is a binary counter that keeps track of the number of attempts entering the pass-code. If the "fail" number is set to three, the user will have three chances to enter the correct code. Otherwise, the system will send a hard signal directly to the alarm. Only the entry of a correct code will disable the alarm. Less than three incorrect codes followed by a correct code will send a "1" to the reset on the counter and clear the running count.

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Car Alarm System

Dan Sarro and Staci Wasserman. Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

For our project we decided to design a car alarm. For the implementation of the design, we used two inputs: D (signifying whether the door was closed(0) or open(1)) and B (whether the buzzer/alarm was off(0) or set(1)). These two inputs could cause the alarm to be in three states: off(00), set(01), or sounding(11). If it was initially in the state '10' it would automatically switch to off. We first drew a state diagram to show how the inputs would cause the various changes between the states. From this, we used what we've learned to make K-maps, obtain algebraic formulas, and draw the circuit diagram. To manipulate these inputs we used a SPDT switch and fed them into two

D-flip-flops according to the circuit diagram we drew. To show the output, we will use a speaker and an LED indicator to signify that the alarm is sounding.

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4-Bit Code Electronic Lock

Ngu Vo. Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

My project would be about a 4 bit code electronic lock. When the push button is pressed and the correct code has been entered, the LED lights up to indicate that unlocking. To change the code, unlock the system first. Press the button and hold more than one second and wait for the LED flashing. Enter the new code and press the button again to lock it. To do this, I need to use two 4-bit shift registers. One of them will be stored in the lock code, and one other will be stored the code that the user entered. There will compare by 4XNOR gates which will output a logic 1 when each bit matches. 4 comparison outputs will be NAND together to indicate matching codes.

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Traffic Signals

Matt Auger, Jeb McCluskey. Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

For our final project, we decided to simulate something with a very practical, everyday purpose. We are designing a traffic signal to control traffic at a four-way intersection. This signal will have two different modes of operation. The first mode will be used for normal daytime operation, using a clock cycle to control the timing of the lights. It will cycle through a five-second green light, a five-second yellow light, and a ten-second red light. When the first signal goes to red, the second signal will cycle through the same process starting with green. Normally after a certain time of night, say ten pm, traffic decreases significantly. To take this into account, the second mode of operation will rely on a pressure-sensitive switch to trigger the light change. The light will default to a green signal on the main road and stay there until a vehicle activates the pressure switch on the side road. At this point, the main light will cycle to yellow then red and the secondary light will switch to green. It will stay green until the pressure switch is deactivated, whereupon the light will cycle to yellow then red and the main light will default back to green. We felt that this would be a worthwhile undertaking because it has real-world application, and it also gives us a good opportunity to display the skills we have learned thus far in the semester.

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Scoreboard for an Electronic Air Hockey Table

Brian Ascoli. Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

For my ELE 202 project, I will be creating a scoreboard for an electronic air hockey table. The game will follow the usual air hockey rules, first to 7 wins, but the winner must win by 2 goals. Although the design is not final yet, there will be 2 inputs, which will be controlled by debounced push buttons. These will represent the button in each goal that is hit when a goal is scored. The scores will be displayed by 2 7-segment LED displays. When the game is won, the scores will reset to 0. When the score is tied 6-6 and a goal is scored, the score will display an "A" representing which player has the advantage. If the player without the advantage scores, the scoreboard will reset to 6-6. If the player with the advantage scores, the scoreboard will show 7-6 and then reset to 0-0 for the next game. The design is not final, there may be another input to manually signal the start of a new game, or possibly other options. These will be decided upon during the projects design and noted in the final presentation. Also, I will be not be working with anyone else on the project.

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Time Bomb Detonator

Kevin Harty Dept. of Electrical Engineering. University of Rhode Island, Kingston, RI

This project is designed to be the control panel for the detonation of a time bomb. It requires a pass code to be entered disarm the countdown sequence to a bomb. There will be a 10 second countdown followed by detonation, which can be disabled at any time during the countdown. The pass code is a 2 bit binary code entered on a DIPswitch with the correct code that is preprogrammed into the system. The disarming sequence utilizes a D FF state machine that cycles through the countdown and aborts when the countdown is stopped. The countdown is controlled by a BCD up/down counter, connected with a MUX chip with a 1 hz clock frequency, and a 7-segment driver chip with the display shown on a 7-segment LED display. A series of OR gates and AND gates is used to detect when the countdown has reached 0 and send a logic 1 to the detonator which will be represented by a speaker. If the correct passcode is found the clock will stop and an LED will light up.

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Stoplight

Ruben Rey and Michael Doucette. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

For our project we will be designing and implementing a stoplight circuit. To complete our circuit we will be using a clock signal, binary counter, 4 7400 NAND gates, and a few variable resistors. The resistors will be varied depending on the amount of time we want to be between changes within the lights.

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A Simple Matching Game/Pseudo Slot-Machine

Nathan Burnell and Kathleen Cooper. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

For our final project, we wanted to design and implement a circuit that is relatively small, yet involves a considerable amount of human interaction. For this reason, we decided to develop a simple matching game, much like a child's version of a slot machine. The first stage of development involved drafting the specifications for the game; two 7-segment LEDs display decimal numbers that increment/decrement at fixed but different frequencies. The player may stop an LED from changing by pressing a single button. The first press of the button halts the first LED and the second press of the button halts the second LED. If both LEDs are equal after being stopped, the game advances to the next level, where the game becomes considerably more difficult (LEDs change at faster rates, and the pattern of change is more erratic). Once the specifications were agreed upon, we began the development process with the creation of a detailed block diagram of the circuit. Since many timing elements are involved, we had to include a system controller. Next, we created the state diagram, state table, and a detailed schematic of the system controller (driven by four JK flip-flops). During the implementation process, we had some difficulty with the hardware—the BCD counters in particular—but we eventually found a solution that worked. The end result is a 19-chip (CMOS) sequential circuit driven with a four JK flip-flops and a 16 Hz clock signal—a mildly entertaining matching game, just as we prescribed.

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Database Search Simulation

Michael Corsi, Christina Drake, and Kimberly Peloquin. Department of Electrical and Computer Engineering, Kingston RI

A circuit was designed which simulated a database search. Both the 8-bit database and the 3-bit search sequence are user controlled. TTL generated and push-button clock signals drive the circuit. A series of D-Flip Flops, which hold the database and search values, will be analyzed using XNOR gates. The outputs of which lead to two different tests. One logic sequence is for recognizing a perfect 3 out of 3 match of the search data against the database. The

second corresponds to a 2 out of 3 match. The related outputs run into their own LED's as well as a BCD counter that keeps track of the match's position within the database. Once a match is found, an LED provides visual confirmation, and a HEX 3-State Inverter shuts off the clock signal to the BCD counter thus holding the match's position.

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4-Way Intersection Traffic Light

Brad Lage, Erik Hanley, Rico dosSantos. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

In our project, we plan to design the logic for a 4-way intersections' traffic lights. It has states for green, red, and yellow lights, the standard for traffic lights. We will have 4 inputs for the 4 streets intersecting, in which a 1 will represent a car presently at the intersection on that street, and a 0 representing no cars at that street ending. To simplify matters, the intersection will be the shape of a plus sign, and the two opposite street inputs will be OR'd in the beginning to create only 2 inputs for the actual circuit. A timer will be implemented from the yellow state into the red state, just like in real life. We hope to make this traffic light as realistic as possible in designing it.

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Four Way Intersection

Jake Bazirgan and Joe Durand. Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

The purpose of our project was to simulate the traffic lights of a four way intersection. There would be a main road that would have a green light as long as there wasn't a car waiting at the red light of a side road. Once a sensor picked up that a car was on the side road, then a counter would be enabled. The side traffic light would turn green and the main traffic light would go from green, to yellow, to red. After this another counter would be enabled and after a certain time the main traffic light would become green again and the side traffic light would go from green, to yellow, to red. In designing this circuit we decided to use two JK flip flops to determine the next state of the inputs. The push button would be used as the sensor on the side road and two dual up counters would be needed for delaying and enabling the lights. AND and OR gates are also needed to complete this circuit.

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Hazards Plus

Daniel Carrigg. Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

The purpose of this project was to create a more noticeable form of emergency hazard lights for any automobile. The design consists of a 555 timer in conjunction with a 14520 Binary up counter. With these two chips, the basic components of Morse Code can be implemented. Now, using simple combinational logic, including and's or's and inverters, along with a state machine consisting of 14175 D-Flip Flops. Any conceivable message can be created with the right logic.

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Customizable Light Display

Harlan Stern, Lou Zell. Department of Electrical Engineering, University of Rhode Island

Our device was designed as an aesthetic component to any person's bedroom. Under the control of a few simple switches, light patterns can be adjusted in order to create the desired ambiance within a room. By making use of multiplexers we have enabled a person to easily select between several different settings. This device should be implemented with light bulbs, but for the purpose of this lab we have made use of LED's. Our intent was to create a simple circuit that could be easily expanded upon to create even more elaborate displays and options.

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Traffic Lights Controller

Lao Vang and Sareh Rajae. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

Our design is the traffic lights controller. This circuit will simulate the functions of a traffic light at a four-way intersection, while assuming that the traffic is light at this intersection, therefore, left hand turns will be achieved through the process of yielding. Each light are assigned to a certain number of states, where each state takes 1 sec to transition. For example, each light transitions through the following patterns: green=5 clock cycles, and yellow =2 clock cycles, and red=9 clock cycles. A "safety" state is also set, where both lights are red for one clock cycle before the other can transition into another state, in case someone tries to catch a yellow light but rams a red light. The state machine for this design consists of four JK flip-flops. Each sets of lights, NS-EW, shares the same state machine but are controlled by two different output decoders. We also included a push-button to manually control the lights. This idea comes into place when, if ever, there are heavy traffics, and there's actually a need for the police to control the lights manually. With the push of the button, one may change the lights (states) at any time he/she wishes. There are other functions a traffic light controller can operate but due to time constraint, we were not able to design a circuit to simulate each and every one of them. Hence, we will not attempt to add more functions unless both of those

described above are working properly. Other suggestions for design implementations include: designing sensors that would change the cycle; designing pedestrian crosswalk buttons; flashing lights in periods of light traffic; and left turn signals.

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Alarm System

Gulshan Arora and Rajesh Ramsingh. Dept. of Electrical Engineering, University of Rhode Island, Kingston RI.

The group has designed an alarm system that can be basically used for most practical security purposes. This alarm system has a 4-bit code, which is used to enable or disable the alarm system. An LED will be used to indicate whether the alarm is on or off. When the alarm is on, and somebody tries to break in, a loud sound will be set off. An additional feature to this alarm system is that it gives the owner the option of changing the code when they want to. An LED is used to indicate when it is okay for the user of the alarm to change the code. In order to design this alarm system, we used 2 4-bit shift registers and 2 comparators. The first register will store the alarm code in it, and the second one will be where the user can input the code. The comparators will compare the two codes, and if they are equal, the output of the comparator will be 1, enabling the user to change the code.

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Electronic Lock

Shyla Booker. Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

For my final project I plan to design the electric lock with LED's that indicate when the lock is locked, unlocked, and when the code can be changed.

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Digital Lock

Kevin McDonough. Computer Engineering, University of Rhode Island, Kingston RI

The design is for a programmable Digital Lock with 4-bit key code. When the correct code is entered the lock is disabled, if however the wrong code is entered three times the system goes into a lockdown state for a specific period of time. Two lights indicate system status: a lock indicator that is on when locked, off when unlocked, and blinks at 1Hz when the key code is being set, the second light is a tamper indicator which illuminates upon lockdown to indicate possible intrusion attempts. The design is accomplished using one 8-bit latch, and one 4-bit comparator. The setting of the key code is accomplished with a multiplexer, which either loops back the previously

coded key to the latch or passes the new key code to the looped portion of the latch. The comparators result is used along with the present state to determine tamper attempts. A large number of adders are used to keep track of inputs while the output (ie. status of the lock) is a direct function of the state. By using a slightly more complicated design (specifically separating tamper and lock functions systems) the state machine reduces to four states thus minimizing the hardware.

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Electronic Lock

Jonathan Barlow. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

The electronic lock uses a 4-bit DIP switch to enter the code, a button for the user to indicate that the code has been entered, and a LED logic indicator to represent locking and unlocking. The lock code is stored using a Quad D flip-flop (CMOS 175). A 4-bit DIP switch is used to enter the lock code. Each of the corresponding bits of the switch and the flip-flop are XNORed and the results are all ANDed together giving a one if they are the same. The button is used as the clock signal for a D flip-flop for which the input is the inverted output. The output Q then alternates between 1 and 0 each time the button is pressed. When the correct code has been entered and the button is pressed the LED lights up to indicate unlocking. When the button is pressed for the second time the LED turns off indicating that it is locked. In addition, each time the button is pressed it enables a 4-bit binary up counter (CMOS 520) which is reset when the button is released. If the button is held in long enough, the 4th bit becomes a 1 and the LED begins flashing and the user is allowed to enter a new lock code, only if the system is already unlocked. When the button is pressed again a signal is sent to the clock of the Quad D flip-flop where the lock code is stored and the new lock code is stored.

30

Time Bomb

Thomas Harrington, Frank Burea, Enrique Blanco. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

Our project is a "time bomb" that's counts down from 9 then changes it's frequency when the clock hits 3, when it hits zero a display of LED's will appear to explode. The only way to stop the count down clock is to hit the correct combination on the dip switch. The way we have done this is with a BCD counter connected to a multiplexer and a BCD to 7 segment display. The frequency is coming from a 555 chip that's run through a 14520 chip that speeds up the frequency by dividing the clock signal by 2HZ, this is important because we have two frequencies one that only is

activated when the clock displays 3. We originally were planning on using a multiplexer to switch the frequencies but instead we designed a switch using an inverter and two AND gates into an OR gate to decide which one to use. To turn the "bomb" off we used a dip switch which only one certain combination can turn terminate the "bomb". This was done by deciding the combination to be 1011, by observing the Karnaugh map for 1011 we used an inverter and three AND gates. Three AND gate's were needed because we could only have two inputs into an AND gate. The display of LED's will be a concentric circles that go off when the clock hits zero.

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Code Breaker

Gary Comtois, Brent Marsden. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

Our project is designed to indicate when a certain number is guessed correctly. The number is a code that we have set up by the wiring of the circuit. There is only one combination of code to that will work. A button is pressed to change each number. When a correct number is guessed, an LED turns on indicating it is indeed a correct number. Once all the numbers are guessed correctly, sets of LED's are turned on in addition to an LED for each number.

32

Sensational Christmas LEDs

Evelina Ruskowski, Brian Lavoie, Scott Sullivan. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

We have created a basic christmas tree lighting system utilizing that which we have learned in our ELE201 and 202 classes. Our LEDs will all flash, alternate between even and odd LEDs flashing, and finally light up sequentially or turn off sequentially. To do this we utilized dip switches, D FF, J-K FF, XOR gates, OR gates, AND gates, and a 2-1 Multiplexer. Our original intent was to light up 8 LEDs, however in the final stage of development we choose to light up only 4. Our reasons for this were to just eliminate some AND gates and an extra Multiplexer. Our logic can be easily adjusted to sccount for eight LEDs or and entire string of christmas lights, which we will explain in our presentation.

33

Frequency Checker

Nate Walker and Kyle Sutherland. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

We're doing a project which I suppose could be called a "frequency checker" in that it calculates and displays the output frequency of a function generator. The frequency to be tested is going to be put into a counter, which is then connected to a series of dividers to determine the value for each digit to be displayed. A seperate 1 Hz clock will control when to start and stop the counting sequence. The results of the count are then displayed using seven segment decoders and displays.

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Alarm Clock

Jennifer A. Rochira. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

The designer of this project is a student enrolled in the ELE 202 course under the Electrical and Computer Engineering Department at the University of Rhode Island, Kingston, Rhode Island. The project is an alarm clock that will count from 0 to 9 seconds and 0 to 9 minutes. (Here, 9 seconds will equal 1 minute.) Inputting a 1 Hz clock signal into a BCD Up/Down Counter creates the signal for seconds. The counter is set to only count up and will reset to 0 after 9. The clock signal is also fed to two LED bulbs to visually indicate the lapse of seconds. The output of the counter is fed through 2 AND and 2 OR gates in order to create a signal of 0 for the first 5 seconds and a signal of 1 for the second 5 seconds. This signal becomes the clock input for the minutes. The minutes is also kept track of by another BCD Up/Down Counter that only counts up and resets to 0 after 9 minutes. This output is fed to a BCD to 7-Segment Driver and then to a 7-Segment LED to visually indicate the lapse of minutes. Both the current minute and the alarm minute may each be preset with 4-bit DIP switches. The alarm is considered not on if its DIP switch is set to a number between 10 and 15. The 7-Segment Led will display the current lapse of minutes as a default, but will also display the alarm minute while a debounced push-button is depressed. The alarm will sound for a 1-minute cycle.

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Whack a Mole

Greg Fellow. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

I am putting something together similar to the Whack-A-Mole game commonly seen at carnivals. The player's objective will be to hit as many moles as possible (up to 10) before the time runs out. In this design, the mole to hit will represented by one of six red LEDs and six buttons corresponding to the LEDs will allow you to "whack" any given mole. To begin playing when the game is in an idle state, any button may be pressed briefly and the lights will be activated. The correct mole at any given time will be

determined by a series of flip-flops and XOR gates which generate an irregular, seemingly random 3-bit output. A 1 of 8 decoder will split their outputs into separate lines for the LEDs and make one or zero “moles” be present at any given time. Any points earned (1 per mole) will be displayed until time is up or the maximum of 10 points has been reached. If the user wishes to exit the game at any time, they may hold any button for more than a second or so. This also prevents the user from cheating because they can’t force a “mole” to stay in its hole and collect points whenever that light is on. Another cheat-guard which has been implemented causes the pressing of multiple buttons simultaneously to be disregarded, even if one of those buttons matches the current “mole.”

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Ethernet Cable Tester

Steven Merluzzo and Tim Parys. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

The plan for our project is an Ethernet cable tester. The basic design involves applying a series of voltages to each of the wire pairs on the Ethernet cable and analyzing the results. Voltages are applied in a sequential manner to avoid confusing results and to isolate defective cable pairs. Each cable pair is identified as being defective if a voltage is applied to one wire in the pair and there is no return voltage on the paired wire (via a shorting pin). A correctly wired pair causes the corresponding LED to turn on. In addition, a fifth LED turns on if and only if all the cable pairs are functioning properly. To check each pair, we used a binary counter and output logic to cycle through outputs and then analyze return values with a series of AND gates, OR gates, and D-flip flops. The clock pulse for the circuit is provided by a 555 timer.