

Third Semester B.E. Degree Examination, June/July 2014

Logic Design

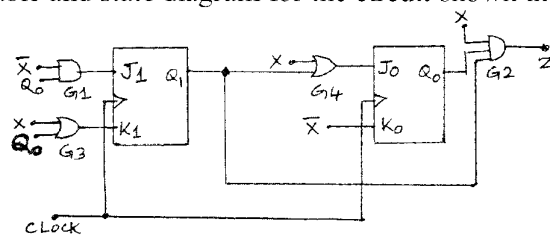
Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1
 - a. Define rise time, fall time in a digital waveform. What is the value of high duty cycle (duty cycle H) if the frequency of a digital waveform is 5 MHz and the width of the positive pulse is 0.05 μ s? (04 Marks)
 - b. Realize the basic gates using only NAND gates. (06 Marks)
 - c. What is positive and negative logic? List the equivalences in positive and negative logic. (04 Marks)
 - d. Write a verilog HDL code using structural model for two input AND gate and prepare test-bench to simulate the circuit. Draw the timing diagram generated by simulating the verilog code. Assume 20 ns holding time of each input combination. (06 Marks)
- 2
 - a. Simplify the Boolean function $F(A, B, C, D) = \sum m(1, 3, 5, 7, 8, 10, 12, 14)$ by using Karnaugh map method and realize the logic circuit using only NAND gates. (06 Marks)
 - b. Draw Karnaugh map of $Y = F(A, B, C, D) = \prod M(0, 1, 2, 4, 5, 10) \cdot d(8, 9, 11, 12, 13, 15)$ and get the simplified POS form of K-map. (04 Marks)
 - c. Get simplified expression of $Y = F(A, B, C, D) = \sum m(2, 3, 7, 9, 11, 13) + d(1, 10, 15)$ using Quine-McClusky method. (10 Marks)
- 3
 - a. What is a multiplexer? Design a 4-to-1 multiplexer using logic gates, write the truth table and explain its working principle. (06 Marks)
 - b. Describe the working principle of 3:8 decoder. Design a circuit that realizes the following functions using a 3 : 8 decoder and multi-input OR gates.
 $F_1(A, B, C) = \sum m(1, 3, 7)$; $F_2(A, B, C) = \sum m(2, 3, 5)$ (06 Marks)
 - c. What is magnitude comparator? Design one bit comparator and write the truth table, logic circuit using basic gates. (06 Marks)
 - d. How does Programmable Logic Arrays (PLA) differ from a Programmable Array Logic (PAL)? (02 Marks)
- 4
 - a. With the help of neat diagram, explain the working of edge triggered JK flip-flop. Write the state diagram and excitation table. (06 Marks)
 - b. What is switch contact bounce? Explain the working principle of a simple RS latch debounce circuit. (04 Marks)
 - c. Write the state table and state diagram for the circuit shown in Fig.Q4(c).



$G_1, G_2 \rightarrow$ AND gate
 $G_3, G_4 \rightarrow$ OR gate

Fig.Q4(c)

(10 Marks)

PART – B

- 5 a. What is a shift register? Draw the logic diagram of a 4 bit serial in serial out (SISO) shift register using negative edge triggered JK or D flip-flops and explain its operation with the waveform to shift the binary number 1010 into the register. (08 Marks)
- b. Explain with logic diagram the use of 8-bit SISO shift register in serial addition of two 8-bit numbers. (08 Marks)
- c. Write verilog HDL code for 4-bit SIPO shift register when all the flip-flop outputs are available externally. (04 Marks)
- 6 a. What are asynchronous and synchronous counters? With a neat block diagram, output waveform and truth table, explain a 3-bit binary ripple counter constructed using negative edge triggered JK flip-flops. (10 Marks)
- b. Design a mod-5 counter using JK flip-flops having the feature that if an unused state appears, the counter will reset to 000 at the next clock pulse. (10 Marks)
- 7 a. With neat block diagrams compare Mealy model and Moore model of sequential logic system. (04 Marks)
- b. Draw the ASM chart for the Mealy machine shown in Fig.Q7(b). (08 Marks)

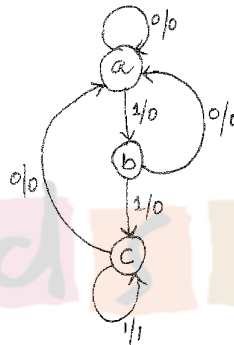


Fig.Q7(b)

- c. Using row elimination method reduce the state diagram shown in Fig.Q7(c).

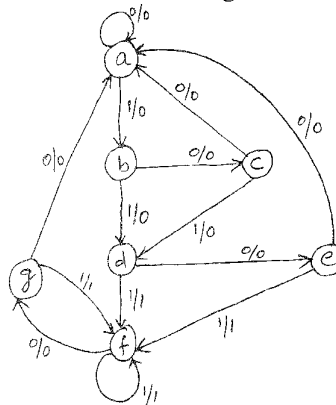


Fig.Q7(c).

(08 Marks)

- 8 a. What is the binary ladder? Explain the binary ladder with a digital input of 1000. (06 Marks)
- b. Define Accuracy and Resolution with respect to DAC. (04 Marks)
- c. With a neat circuit diagram, explain parallel ADC. (10 Marks)
