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Question Paper Code : 90151

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Third Semester

Computer Science and Engineering

CS 8351 – DIGITAL PRINCIPLES AND SYSTEM DESIGN

(Common to Electronics and Telecommunication Engineering/Information Technology)

(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. What is the main difference between canonical and standard form ?
2. Given two binary numbers $A = 1010010$ and $B = 1000011$, find $A - B$ and $B - A$ using 2's complements.
3. What is multiplexer ? Show the block diagram of 4×1 multiplexer.
4. What is magnitude comparator ?
5. Why is the stimulus signals in a test bench be synchronized to the inactive edge of the clock of the sequential circuit that is to be tested ?
6. Differentiate between synchronous and asynchronous sequential circuit.
7. What is hazard and what is the cause of hazard in combinational and sequential circuits ?
8. What are the needs for asynchronous circuits ?
9. How many $32K \times 8$ RAM chips are needed to provide a memory capacity of 512K bytes ?
10. Compare SRAM and DRAM.



PART – B

(5×13=65 Marks)

11. a) Simplify the following Boolean function into (i) sum-of-products form and (ii) product-of-sums form and implement the simplified functions using AND, OR gates $F(A, B, C, D) = \Sigma(0, 1, 2, 5, 8, 9, 10)$. (13)
- (OR)
- b) What are universal gates ? Construct any four basic gates using only NOR gates and using only NAND. (13)
12. a) What is BCD adder ? Design an adder to perform arithmetic addition of two decimal digits in BCD. (13)
- (OR)
- b) i) Design a 4-bit adder/subtractor circuit and explain. (8)
- ii) Implement Boolean function $F(x, y, z) = \Sigma(1, 2, 6, 7)$ using multiplexer. (5)
13. a) Design a 3-bit binary counter using T flip flops. (13)
- (OR)
- b) i) What are registers ? Construct a 4-bit register using D flip-flops and explain the operations on the register. (7)
- ii) With diagram explain how two binary numbers are added serially using shift registers. (6)
14. a) Draw the block diagram of a typical asynchronous sequential circuit and explain. Also write the procedure for obtaining transition table from circuit diagram of an asynchronous sequential circuit. (13)
- (OR)
- b) An asynchronous sequential circuit is described by the following excitation and output functions :
- $$Y = x_1x'_2 + (x_1 + x'_2)y$$
- $$Z = y$$
- i) Draw the logic diagram of the circuit. (6)
- ii) Derive the transition table and output map. (7)
15. a) What is PLA ? Draw a PLA circuit to implement the Boolean functions : (13)
- $$F1 = AB' + AC + A'BC'$$
- $$F2 = (AC + BC)'$$
- (OR)
- b) What is ROM and why is it necessary to use ROM in a computer ? Explain various types of ROM in detail. (13)



PART - C

(1×15=15 Marks)

16. a) A sequential circuit with two D flip-flops A and B, two inputs x and y; and one output z is specified by the following next-state and output equations :

$$A(t+1) = xy' + xB$$

$$B(t+1) = xA + xB'$$

$$z = A$$

- i) Draw the logic diagram of the circuit. (8)
- ii) List the state table for the sequential circuit. (4)
- iii) Draw the corresponding state diagram. (3)

(OR)

b) Design a combinational circuit that converts a four-bit Gray code to a four-bit binary number using exclusive-OR gates.
