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Question Paper Code : 40387

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

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 — ($10 \times 2 = 20$ marks)

1. What are the basic digital logic gates?

2. Find the complement of the expression – $(x + y' + z)(x' + z')(x + y)$.

3. What is priority encoder?

4. List out the applications of multiplexer.

5. What is sequential circuit?

6. How many flip-flops are required to build a binary counter that counts from 0 to 1023?

7. Define hazard and when do hazard occur?

8. Define flow table in asynchronous sequential circuit.

9. List the major differences between PLA and PAL.

10. Differentiate volatile and non-volatile memory.

PART B — (5 × 13 = 65 marks)

11. (a) Express the following numbers in decimal

(i) $(10110.0101)_2$ (3)

(ii) $(16.5)_{16}$ (3)

(iii) $(26.24)_8$ (3)

(iv) $(FAFA.B)_{16}$ (2)

(v) $(1010.1010)_2$. (2)

Or

(b) Using K map, minimize the expression

$F(A,B,C,D) = \Sigma m(1,3,4,6,8,9,11,13,15) + \Sigma d(0,2,14)$.

12. (a) Design a full adder and realize using gates. Implement full adder with two half adders and an OR gate.

Or

(b) (i) Implement the Boolean expression $F(A,B,C) = \Sigma m(0,2,5,6)$ using 4 : 1 multiplexer. (7)

(ii) Implement $F(A,B,C,D) = \Sigma m(0,1,5,6,8,10,12,15)$ using 8 : 1 multiplexer. (6)

13. (a) Show that the characteristic equation for the complement output of a JK flip-flop is $Q'(t+1) = J'Q' + KQ$.

Or

(b) Design and implement a synchronous 4-bit up/down binary counter using T flip-flops.

14. (a) An asynchronous sequential circuit is described by the following excitation and output function,

$Y = x_1x_2 + (x_1 + x_2)y$

$Z = Y$.

(i) Draw the logic diagram of the circuit. (5)

(ii) Derive the transition table, flow table and output map. (5)

(iii) Describe the behavior of the circuit. (3)

Or

(b) Explain with neat diagram about the static hazard and the way to eliminate it.

15. (a) A 12-bit Hamming code word containing 8 bit of data and 4 parity bits is read from memory. What was the original 8-bit data word that was written into memory if the 12 bit word read out is as follows?

(i) 00001 110101 0 (4)

(ii) 10111 00001 10 (4)

(iii) 101111 110100 (5)

Or

(b) Tabulate the PLA programming table for the four Boolean functions listed below. Minimize the numbers of product terms.

$A(x, y, z) = \Sigma m(1,2,4,6)$

$B(x, y, z) = \Sigma m(0,1,6,7)$

$C(X, y, z) = \Sigma m(2, 6)$

$D(x, y, z) = \Sigma m(1,2,3, 5,7)$

PART C — (1 × 15 = 15 marks)

16. (a) Design an adder to perform arithmetic addition of two decimal digits in BCD.

Or

(b) Design and write a HDL code for combinational circuits that's a four bit Binary code to four bit Gray code using Exclusive – OR gates.

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