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Question Paper Code : 70085

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Third Semester

Electronics and Communication Engineering

EC 3352 — DIGITAL SYSTEMS DESIGN

(Common to : Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find the octal equivalent for the given decimal number (149)₁₀.
2. Simplify the Boolean function $xy + x'z + yz$ to a minimum number of literals.
3. What is meant by combinational circuits? Give examples.
4. What is a parity bit?
5. Find the minimum number of flip flops required to build a modulo N counter.
6. Draw the master slave configuration using D-flip flop.
7. Differentiate between critical and non-critical race in asynchronous sequential circuits.
8. What is meant by fundamental mode sequential circuit?
9. Define fan in and fan out of a gate?
10. Write the difference between EPROM and EEPROM.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Simplify the four variable boolean function $F(A,B,C,D) = \text{Sum}(0,2,3,5,7,8,9,10,11,13,15)$ and find the prime implicants and essential prime implicants. (8)
- (ii) Express the Boolean function $F = xy + x'z$ as a product of maxterms. (5)
- Or
- (b) Minimize the expression $Y(A,B,C,D) = \text{Sum } m(0,1,3,7,8,9,11,15)$ using tabulation method.
12. (a) (i) Explain the working of 3-bit even parity generator and checker. (7)
- (ii) Illustrate the operation of priority encoder. (6)

Or

- (b) (i) Design a full adder and implement in sum-of-product form. (7)
 - (ii) Construct the 4 x 16 decoder with two 3 x 8 decoders. (6)
13. (a) Elucidate the analysis and design of clocked sequential circuits with a suitable example.

Or

- (b) List out the capabilities of a universal shift register. Illustrate the four bit universal shift register with a function table and explain its working.
14. (a) Mention the types of hazard that occur in combinational circuits? Demonstrate the occurrence of static 0-hazard with a suitable example and find the solution to fix the static hazard in combinational circuits.

Or

- (b) Taking relevant examples, explain the various types of races that occur in sequential circuits. Also briefly explain about the race free state assignment.
15. (a) Design the following sum-of-minterms using PAL. $W(A,B,C,D) = \text{Sum}(2, 12, 13)$; $X(A,B,C,D) = \text{Sum}(7,8,9,10,11,12,13,14,15)$; $Y(A,B,C,D) = \text{Sum}(0,2,3,4,5,6,7,8,10,11,15)$; $Z(A,B,C,D) = \text{Sum}(1,2,8,12,13)$

Or

- (b) (i) Draw and explain the totempole TTL output configuration. (6)
- (ii) Compare the characteristics of RTL, TTL, ECL and CMOS logic families. (7)

PART C — (1 × 15 = 15 marks)

16. (a) Design a counter using JK flip flops with the following binary sequence: 1, 2, 5, 7 and repeat.

Or

- (b) Design the binary to gray code converter and draw the simplified logic diagram in sum-of-product form.
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