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Question Paper Code: R2804

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Second Semester

Information technology

R21UIT204 - DIGITAL PRINCIPLES & SYSTEM DESIGN

(Regulations R2021)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Find 2's complement of $(11000100)_2$ CO2-App

    a) $(00111100)_2$ b) $(111111)_2$ c) $(1100010)_2$ d) $(11110101)_2$

2. What is the output of that $A + \bar{A}B =$ CO2-App

    (a) A+B   (b) B+A   (c) A+A   (d) A+B

3. The result obtained on binary multiplication of 1010*1100 is _____   CO2-App

    (a) 1111000   (b) 1111001   (c) 1111000   (d) 1111001

4. The Simplified expression of full subtractor Borrow is_____   CO1-U

    (a) $B_{out}=\bar{A}B_{in}+\bar{A}B + BB_{in}$ (b) $B_{out}=BA_{in}+BB +BA_{in}$

    (c) $B_{out}=AB_{in}+BA+AA_{in}$ (d) $AB_{in}+BB_{in+}BB_{in}$

5. If the number of n selected input lines is equal to 2^m then it requires_____selected lines   CO1-U

    (a) n   (b) m   (c) 2   (d) 2n

6. For re programmability, PLDs use _____   CO1-U

    (a) PROM   (b) EPROM   (a) PROM   (d) De Multiplexer

7. The functional difference between SR flip-flop and JK flip-flop is that   CO1-U

    (a) JK flip-flop is faster than SR flip-flop   (b) JK flip-flop has a feedback path

    (c) JK flip-flop accepts both inputs 1   (d) JK flip-flop does not require external clock

8. A counter circuit is usually constructed of _____   CO1-U

   (a) A number of latches connected in cascade form

   (b) A number of NAND gates connected in cascade form

   (c) A number of flip-flops connected in cascade

   (d) A number of NOR gates connected in cascade form

9. A condition occurs when an asynchronous sequential circuit changes   CO1-U
   two or more binary states variable is _____.

   (a) deadlock condition   (b) Running condition   (c) Race condition   (d) None

10. The race in which stable state depends on order is called   CO1-U

    (a) critical race   (b) identical race   (c) non critical race   (d) defined race

PART – B (5 x 2= 10Marks)

11. Identify the 2's complement of the following: CO2-App
    (i) 1111111
    (i) 101010

12. Derive the K-map and draw the logic diagram of full-adder   CO2-App

13. Draw the truth table and circuit diagram of 4 to 2 encoder.   CO2-App

14. Construct the Excitation table for J-K Flip flop   CO2-App

15. Outline on Hazards and its effect on circuit   CO2-App

PART – C (5 x 16= 80Marks)

16. (a) Minimize the expression using QuineMccluskey method: CO2-App (16)
    $$Y = \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + AB\bar{C}\bar{D} + AB\bar{C}D + A\bar{B}\bar{C}D + \bar{A}BCD$$

                           Or

    (b) Simplify the following Boolean Expression: CO2-App (16)
        i) $Y = AB + A(B + C) + B(B + C)$ (4)
        ii) $Y = \overline{AB}(\bar{A} + B)(\bar{B} + B)$ (4)
        iii) $Y = \overline{\bar{A}\bar{C} + \bar{B}\bar{C} + B\bar{C} + ABC}$ (4)
        iv) $Y = \overline{A + \bar{A}B + \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C}D}$ (4)

17. (a) Derive the truth table for full adder and simplify the K-map for its CO2-App (16)
         outputs. Draw its block schematic and logic diagram of sum of
         product (SOP) implementation of full adder.

                           Or

    (b) Design a logic circuit to convert BCD to gray code.   CO2-App (16)

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18. (a) Realize F(w,x,y,z)=$\sum$(1,4,6,7,8,9,10,11) using 4 to 1 MUX. CO2-App (16)

<div align="center">Or</div>

 (b) Design a switching circuit that converts a 4 bit binary code into a 4 CO2-App (16)
bit Gray code using ROM array

19. (a) Construct a S-R Flip-Flop with 2-bit input values 00,01,10 & 11 CO2-App (16)
and reclaim its states necessary logic diagram

<div align="center">Or</div>

 (b) Design divide by 6 counter using T-flip-flops. Write state table and CO2-App (16)
reduce the expression using K-map

20. (a) Design an asynchronous sequential circuit with two inputs x1 and CO2-App (16)
x2 and one output Z. Initially both inputs are equal to zero. When
x1 or x2 becomes 1 the output Z becomes 1 . When the second
input also becomes 1 the output changes to 0. The output stays at 0
until the circuit goes back to the initial state.

<div align="center">Or</div>

 (b) Give hazard– free realization for the following Boolean function CO2-App (16)
F(A,B,C,D) = $\sum$ (0,2,4,5,8,10,14)
f(A,B,C,D) =π (3,4,7,8,9,12,15)

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