A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: R2804

B.E. / B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Second Semester

Information Technology

R21UIT204 – DIGITAL PRINCIPLES AND SYSTEM DESIGN

(Regulations R2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. What is the base conversion of decimal number for the following Binary number: 1101001? CO2-App

   (a) $(10)_2$ (b) $(10)_5$ (c) $(10)_6$ (d) $(10)_7$

2. What are all the Universal Gates_____ CO1- U

   (a) AND,OR (b) NAND ,NOR (c) AND,NOT (d) NOR,AND

3. 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) $B_{out}=AB_{in}+BA+AAin$ (d) $AB_{in}+BB_{in+}BB_{in}$

4. Convert Gray code 1110 to binary_____ CO2-App

   (a) 1011 (b) 1111 (c) 1010 (d) 1100

5. How many NOT gates are required for the construction of 4 to 1 multiplexer_____ CO2-App

   (a)1 (b) 2 (c) 3 (d) 4

6. How many selection lines would be required for an 8-line-to-1-line MUX? CO1-U

   (a) 2 (b) 3 (c) 4 (d) 8

7. The input values for J-K flipflop to go to Toggle state are _____. CO1- U

   (a) 00 (b) 01 (c) 10 (d) 11

8. The main difference between a register and a counter is _____ CO1- U

(a) A register has no specific sequence of states

(b) A counter has no specific sequence of states

(c) A register has capability to store one bit of information but counter has n-bit

(d) A register counts data

9. Asynchronous sequential logic circuit not uses CO1- U

(a) inputs (b) outputs (c) clock pulses (d) time

10. Which one is the suitable to detecting the hazard in circuit? CO1- U

(a) Karnaugh map (b) Boolean expression (c) Logic gates (d) None of these

PART – B (5 x 2= 10 Marks)

11. Convert the given number from Hexadecimal to binary: $9AF_{16}$ CO2-App

12. Draw the truth table for half-adder circuit. CO2-U

13. Mention the uses of Decoder. CO1 -U

14. Draw the Excitation table of SR flip-flop CO2-U

15. Explain about race condition CO1-U

PART – C (5 x 16= 80 Marks)

16. (a) i) $Y = AB + A(B + C) + B(B + C)$ CO2-App (16)

ii) $Y = \overline{AB}(\bar{A} + B)(\bar{B} + B)$

iii) $\overline{Y = \bar{A}\bar{C} + \bar{B}\bar{C}} + B\bar{C} + ABC$

iv) $\overline{Y = A + \bar{A}B + \bar{A}\bar{B}C} + \bar{A}\bar{B}\bar{C}D$

Or

(b) Simplify the following Boolean function by using the Tabulation method CO2-App (16)

$F = m(0, 1, 2, 8, 10, 11, 14, 15)$

17. (a) Design a circuit for BCD addition CO1-U (16)

Or

(b) Design a logic circuit to convert BCD to gray code CO1-U (16)

18. (a) Implement the following function using DEMUX. CO2-App (16)
F1(A,B,C)=∑(0,3,7) F2(A,B,C)=∑(1,2,5)

Or

(b) Design a 2 bit comparator using basic gates CO2-App (16)

19. (a) Explain the operation of JK flip-flops and SR Flip flops with suitable diagrams? CO1-U (16)

Or

(b) Design a MOD5 synchronous counter using JK flip-flops and implement it. Also draw the timing diagram. CO1-U (16)

20. (a) Design an asynchronous sequential circuit with two inputs X and Y and with one output Z. Whenever Y is 1, input X is transferred to Z. When Y is 0, the output does not change for any change in X. CO2-App (16)

Or

(b) Give hazard– free realization for the following Boolean function CO2-App (16)
F(A,B,C,D) = ∑ (1,3,5,7,9,14,15)
F(A,B,C,D) =∑ (1,5,7,14,15)