F 9283

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Reg. No..... 10

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Computer Science and Engineering

LOGIC SYSTEM DESIGN (R)

[2009 admissions—Improvement
2004 – 2009 admissions—Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 4 *marks.*

1. Perform the following :

   (a) $(101101.10101)_2 \rightarrow (\ ?\ )_{10}$

   (b) $48_{10} - 29_{10} \rightarrow (\ ?\ )_2$.

   Convert the numbers into binary and subtract using 2's complement method.

2. What is BCD ? What are its advantages and disadvantages ?

3. Using Boolean theorems, prove

   $(A + C)(A + D)(B + C)(B + D) = AB + CD$.

4. Obtain the complements of the following expressions :

   (i) $A + BC + AB$. (ii) $A(B + C)(\overline{C} + \overline{D})$.

5. Explain the function of a D flip-flop using a suitable diagram and slow how it works as a latch.

6. What factors determine whether a counter operates as a count-up or count-down type ? Explain with necessary diagrams.

7. Show how a full adder can be converted to a full subtractor with the inclusion of an inverter circuit.

8. Design a half subtractor using only basic gates.

9. Why are shift registers considered to be basic memory devices ? What are the different types of shift registers ?

10. What are the differences between Johnson counter and ring counter ? What are their applications ?

(10 × 4 = 40 marks)

Turn over

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) Express the following as Excess-3 codes :

(i) 1947. (ii) 2011.

(iii) 2000. (iv) 649.

(b) What are weighted and non-weighted codes ? Explain with suitable examples.

Or

12. (a) Encode the following binary numbers into 7 bit even parity Hamming code :

(i) 0101. (ii) 1000.

(iii) 1011. (iv) 1010.

(b) Convert the following decimals to Gray codes :

(i) 369. (ii) 105.

(iii) 69. (iv) 90.

Module 2

13. (a) Convert $f = ABCD + \bar{A}BC + \bar{B}\bar{C}$ into a sum of minterms by algebraic method. (5 marks)

(b) Using K-map, simplify the following function, and obtain minimum product of sums form and draw the circuit.

(7 marks)

Or

14. A corporation having 100 shares entitles the owner of each share to cast one vote at the shareholder's meeting. Assume that A has 40 shares, B has 30 shares, C has 20 shares and D has 10 shares. A two-third majority is required to pass a resolution in a shareholder's meeting. Each of these four men has a switch which he closes to vote YES and opens to vote NO for his percentage of shares. When the resolution is passed the output, LED must be ON. Derive a truth-table for the output function and give the sum of product equation for it. Draw the minimal logic circuit diagram.

Module 3

15. (a) Draw the circuit diagram of a master-slave JK flip-flop and show how the race around condition is eliminated in it ?

(b) What are the differences in the operation of master-slave and edge-triggered flip-flops ? Compare and contract their performances.

Or

16. Design a synchronous counter using K-maps following sequence : 000, 010, 101, 110 and repeat. The undesired states 001, 011, 100 and 111 must always go to 000 on the next clock pulse. Draw the circuit diagram.

Module 4

17. Design and draw the logic diagram of a circuit for addition/subtraction. Use a control variable W and a circuit that functions as a full-adder when W = 0, as a full-subtractor when W = 1.

Or

18. With a neat circuit diagram, explain the working of a carry save adder. What are its merits and limitations ?

Module 5

19. Using K-map, design a 4-bit self correcting ring counter, assuming 0000 as initial state. Draw the circuit diagram.

Or

20. Draw the logic diagram for a divide-by-18 Johnson counter. Sketch the timing diagram and write the sequence in tabular form.

(5 × 12 = 60 marks)