

Subject: LOGIC DESIGN

Time: 3 Hours

DECEMBER 2010

Max. Marks: 100

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after half an hour of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. A quantity having continuous values is called a _____
- (A) digital quantity (B) analog quantity
(C) binary quantity (D) natural quantity
- b. The maximum count of a 2 digit and 3 digits Hex No. is _____
- (A) FFFH & FFH (B) FFH & FFFH
(C) FFH & FFFFH (D) AA & FFF
- c. The gate ideally suited for bit comparison is _____
- (A) Two input EX-OR gate (B) Two input EX-NOR gate
(C) NOR gate (D) NAND gate
- d. A maximum positive and negative numbers which can be represented in 2's complement form using n bits is _____
- (A) $+(2^{n-1}-1), -(2^{n-1}-1)$ (B) $+(2^{n-1}-1), -2^{n-1}$
(C) $+2^{n-1}, -2^{n-1}$ (D) $+2^{n-1}, -(2^{n-1} + 1)$
- e. ASCII code is basically a _____
- (A) 7 bit code (B) 12 bit code
(C) 4 bit code (D) 6 bit code
- f. 2 numbers can be adjacent only if they differ by _____
- (A) 2^n (B) $2 \times n$
(C) 4 (D) n^2

g. The dual of a boolean function is obtained by _____

- (A) interchanging all 0's & 1's only
- (B) changing all 0's to 1's only
- (C) changing all 1's to 0's only
- (D) inter changing (i) all 0's & 1's (ii) '+' and '.' signs.

h. A combinational circuit _____

- (A) never contains memory elements
- (B) always contains memory elements
- (C) may sometimes contain memory elements
- (D) contain only memory elements

i. How many 4 bit word can be stored in 512 bit ROM

- (A) 512
- (B) 128
- (C) 2048
- (D) 64

j. Number of Flip-flops required to construct a MOD 64 counter is _____

- (A) 64
- (B) 4
- (C) 33
- (D) 6

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Explain with a block diagram, the functional parts of a digital computer (2+6)

b. Do the conversions for the following:

- (i) $(0.3125)_{10}$ to Binary
- (ii) Hex equivalent of $(1110\ 1101\ 1110\ 10)_2$
- (iii) $(0.325)_8$ to decimal
- (iv) $(100\ 111\ 010)_2$ to octal (4 × 2 = 8)

Q.3 a. Solve the following: (4)

(i) $\overline{\overline{XY} + XYZ} + X(Y + X\overline{Y})$

(ii) Write the truth table for the circuit given in Fig.1 indicating intermediate variables and also the boolean expression for the output. (2+2)

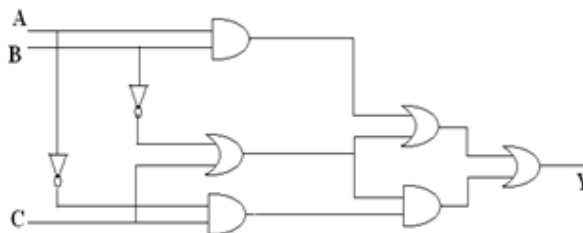


Fig.1

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- b. Simplify the given boolean function using 4 variable k map in SOP and POS forms. Also realize in the simplified expressions using NAND and NOR gates. (2 × 4 = 8)
- $F(a, b, c, d) = \sum m(0, 1, 2, 3, 10, 11, 12, 13, 14, 15)$.
- Q.4** a. Explain in detail, the working of an edge triggered JK Flip-Flop. (4+2+2)
- b. Explain the operating characteristics of Flip-Flops. (4 × 2 = 8)
- Q.5** a. Describe a n bit binary ripple carry adder showing typical carry propagation delays. (4+4)
- b. Subtract the following numbers using 2's complement method and also show direct subtraction.
- (i) 11100 from 10011. (2)
- (ii) Add + 128 and -130 (2)
- c. (i) Add 647 and 482 in BCD code (4)
- Q.6** a. Describe the working of asynchronous decade counter. (2+2+4)
- b. Design a Mod 3 synchronous counter using JK Flip-Flops. (2+2+2+2)
- Q.7** a. What is a multiplexer? Draw the diagram of a 8:1 multiplexer with expressions and truth table. (4+4)
- b. Draw and explain BCD to 7 segment decoder. (2+4+2)
- Q.8** a. Explain the working of a shift left & shift right register. (4+4)
- b. Explain in detail, the operation of Johnson counter. (8)
- Q.9** a. Define the following terms:
- | | | |
|--------------------------|----------------------------|-------------|
| (i) Static memory device | (ii) Dynamic memory device | |
| (iii) Internal memory | (iv) External memory | (4 × 2 = 8) |
- b. What is RAM? What are its various types and explain each type. (8)