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I Semester Diploma Examination, May 2010

ELECTRONICS &amp; COMMUNICATION ENGG. BOARD

DIGITAL ELECTRONICS – I

Time : 3 Hours ]

[ Max. Marks : 100

Instructions : (1) Section-A is compulsory.

(2) Answer any *two* main questions from each of the remaining sections B, C & D.

## SECTION – A

- (a) Fill in the blanks : 5 × 1 = 5
- (i) \_\_\_\_\_ gate is used as equality detector.
- (ii) The product terms in a SOP expression are called \_\_\_\_\_ terms.
- (iii) Race around condition is present in \_\_\_\_\_ flip flop.
- (iv) CMOS logic family has highest packing density.
- (v) \_\_\_\_\_ number of flip flops are required to construct a decade counter.
- (b) What are Boolean variables ? State the identities of Boolean addition and Boolean multiplication. 5

## SECTION – B

2. (a) What are weighted and unweighted codes ? Give examples. 3
- (b) Perform the following operations : 2 × 5 = 10
- (i) Convert hexadecimal number B3F9 into octal number.
- (ii) Subtract 10011 from 11001 using 1's complement method. 5 COS
- (iii) Subtract hexadecimal number 2FA5 from 194 A. COF
- (iv) Convert decimal number 678 to Excess-3 code. 2
- (v) Divide  $(1101)_2$  by  $(100)_2$ . 5
- (c) Define radix of a number system. 4
3. (a) State and prove Demorgan's theorems. 6
- (b) Convert the binary number 110100 into gray code and write the necessary steps.
- (c) Write the logic symbol, expression and truth table for the following logic gates :
- (i) NAND
- (ii) EX-NOR

[Turn over

4. (a) Realise :

- (i) OR gate
- (ii) AND gate

Using only NOR gates.

(b) Explain the interfacing of TIL to CMOS IC's.

(c) Using k-map simplify the following expression and draw the logic circuit for the simplified expression.

$$X = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}CD + A\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + A\bar{B}CD$$

### SECTION - C

5. (a) What is an adder? Explain logic diagram with truth table.

(b) Explain the operation of a half subtractor with the help of logic diagram and truth table.

(c) Differentiate combinational and sequential logic circuits.

6. (a) Explain BCD to decimal decoder with gate level circuit and truth table.

(b) Draw the logic circuit of a 4-bit parallel adder.

(c) Write a note on encoders.

7. (a) Explain 4 : 1 multiplexer with the help of logic circuit and truth table.

(b) Explain 1 : 8 demultiplexer along with logic diagram and Truth Table.

(c) Compare serial adder and parallel adder.

### SECTION - D

8. (a) Explain the operation of clocked RS-flip flop using NAND gates.

(b) Explain the different types of triggering.

(c) Explain the operation of D flip flop with logic circuit and truth table.

9. (a) Explain the working of a 4-bit synchronous counter with truth table.

(b) Define modulus of a counter.

(c) Realize decade counter with a neat sketch and truth table.

10. (a) Explain the working of a 4-bit SISO shift register with logic diagram and truth table.

(b) Explain the operation of a 4-bit Johnson counter with truth table and timing diagram.