2022

ELECTRONICS — HONOURS

Paper : CC-9

(Digital Electronics and VHDL)

Full Marks : 50

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Answer ***question no.*** **1** and ***any four*** questions from the rest, taking ***at least one*** from ***each Unit.***

1. Answer ***any ten*** questions : 1×10

(a) What is the BCD equivalent of $(75)_{10}$?

(i) $(01110101)_2$ (ii) $(111101)_2$

(iii) $(111011)_2$ (iv) $(01110110)_2$

(b) Which of the Boolean functions has canonical form?

(i) $F = \bar{A}\bar{C} + \bar{C}D$ (ii) $F = \bar{A}B\bar{C} + AB\bar{C}$

(iii) $F = \bar{B} + AB$ (iv) $F = ACD + AB\bar{C}\bar{D}$

(c) The logical expression $F = \bar{A}B + A\bar{B}$ is associated to the term.

(i) Inequality checker (ii) Equality checker

(iii) Odd parity checker (iv) Even parity checker.

(d) Multiplexers are

(i) Synchronous sequential circuits (ii) Asynchronous sequential circuits

(iii) Combinational circuits (iv) None of these.

(e) The correct form of De Morgan's theorem is

(i) $A \cdot \bar{B} = A + \bar{B}$ (ii) $\bar{A} + \bar{B} = \bar{A}\ \bar{B}$

(iii) $\overline{AB} = \overline{A + B}$ (iv) $\overline{A + B} = \bar{A} \cdot \bar{B}$.

(f) The time between 2 pulses may vary from

(i) 1 μsec to 18 μsec (ii) 1 μsec to 10 μsec

(iii) 1 msec to 10 msec (iv) Can't be said.

(g) Apart from the use in integrated circuits CMOS technology also used in

(i) Calculators (ii) Wrist watches

(iii) Battery driven computers (iv) All of the above.

(h) Which of the following is the correct order for IC families according to technology?

(i) RTL, DTL, I^2L, TTL (ii) TTL, DTL, ECL, I^2L

(iii) RTL, DTL, TTL, ECL (iv) TTL, HTL, RTL, DTL.

(i) What is a D-FF?

(i) It is basically a S–R FF with an inverter in the R input.

(ii) It is basically a S–R FF with an inverter in the S input.

(iii) It is a S–R FF with shorted RS inputs.

(iv) It is not at all related to S–R FF.

(j) A package in VHDL consists of

(i) Commonly used architectures (ii) Commonly used tools

(iii) Commonly used datatypes and subroutines

(iv) Commonly used syntax and variable.

(k) Pre-defined data for an VHDL object is called

(i) Generic (ii) Constant

(iii) Attribute (iv) Library.

(l) What is the use of the configuration statement?

(i) To configure the components exactly in design.

(ii) To complete the design process by adding libraries.

(iii) To add more than one entities into a single architecture.

(iv) To add some component in any entity architecture pair.

Unit - I

2. (a) Convert decimal number 52.89 to hexadecimal.

(b) Subtract the BCD numbers (73–56).

(c) Prove De Morgan's theorems using Boolean algebra.

(d) Write down the truth table of NAND gate. 2+3+(2+2)+1

3. (a) Simplify following Boolean function using K-Map. $F = \sum m\ (1, 5, 7, 11, 15)$ with a don't care function $D = \sum m\ (3, 9, 12)$.

(b) What is meant by noise immunity?

(c) Briefly explain totem pole connection in TTL. 4+2+4

$\overline{A \cdot B} = \overline{A} + \overline{B}$

$\overline{A}(\overline{B}+B)+$

Unit - II

4. (a) What is a decoder? Why is it also called as minterm generator?

   (b) What is the significance of the term 'half' in 'half-adder'? How can a full-adder be constructed by cascading two half-adders?

   (c) What is an encoder? (1+2)+(2+3)+2

5. (a) Compare between combinational logic circuit and sequential logic circuits.

   (b) Explain the operation of J-K FF with diagram. Also write down its truth table.

   (c) Convert J-K FF to T-FF.

   (d) Write down any two basic features of clock pulses. 3+(2+1+1)+2+1

6. (a) Compare between synchronous and asynchronous counters.

   (b) Design a 8-bit ring counter and describe its working principle.

   (c) What is a shift register? 2+(3+3)+2

Unit - III

7. (a) Define an entity in VHDL.

   (b) What is sequential statements?

   (c) What is the most basic form of behavioral modelling in VHDL?

   (d) What is a sensitivity list?

   (e) Compare between inertial delay and transport delay. 2+2+1+2+3

8. (a) Write down some important features of VHDL.

   (b) What is the importance of delay in VHDL?

   (c) Is VHDL a structured software?

   (d) What does = > mean in VHDL?

   (e) What is process declarative region and process statement region? 2+2+1+1+(2+2)