TED (15) – 3133

(REVISION — 2015)

Reg. No..

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2019

DIGITAL COMPUTER PRINCIPLES

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I   Answer *all* questions in one or two sentences. Each question carries 2 marks.

1. Convert $(41.6875)_{10}$ to binary.

2. Which gates are called universal gates and why ?

3. What is don't care condition ? Mention its use.

4. What are flip-flops ? Give examples.

5. What is hamming code, also specify its applications ? $(5 \times 2 = 10)$

PART — B

(Maximum marks : 30)

II   Answer any *five* of the following questions. Each question carries 6 marks.

1. Simplify the following Boolean functions to a minimum number of literals.
   Also implement the Boolean functions with gates.

   (a) $F(X, Y, Z) = (X + Y)(Y + Z)$ (b) $F(X, Y, Z) = XY + X'Z + YZ$

2. Design a full adder circuit using two half adders. Realize it using logic diagram
   and block diagram.

3. Minimize the expression $F(X, Y, Z) = \Sigma(0, 2, 3, 4, 5, 6)$ using K- map and implement
   it in NAND logic.

4. Compare and contrast combinational and sequential circuits.

5. Using suitable example explain race condition. How can it be avoided ?

6. Design a 4-bit ring counter. Also represent it using timing diagram and state diagram.

7. Categorize and explain different types of ROMS. $(5 \times 6 = 30)$

Marks

PART — C

(Maximum marks : 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

Unit — I

III   Define Boolean algebra. List the Boolean laws for algebraic expressions.   15

Or

IV   (a)   Express the following boolean expressions in minterms and maxterms.

       (i) $\bar{A} + \bar{B}$ (ii) $A(\bar{B} + A)B$ 10

      (b)   State De Morgan's Theorem. Using it, reduce the following expressions.

       (i) $\overline{AB} \ (CD + \overline{EF(\overline{AB} + \overline{CD})})$ (ii) $\overline{AB} + \bar{A} + AB$ 5

Unit — II

V   (a)   Minimize the following expression using K-map :

       $F(W, X, Y, Z) = \Sigma(1, 4, 7, 10, 13) + \Sigma d(5, 14, 15)$ 5

      (b)   Design a 2-bit magnitude comparator and illustrate using a neat logic diagram.   10

Or

VI   (a)   Minimize the following expression using K-map :

       $F(A, B, C, D) = \Sigma(4, 5, 7, 12, 14, 15) + \Sigma d(3, 8, 10)$ 5

      (b)   Design and explain the working of a 4-input multiplexer with the help of logic diagram. What are the applications of multiplexers ?   10

Unit — III

VII   (a)   Design JK flip-flop using D flip-flop and verify it using characteristic table and equation.   5

      (b)   Design a synchronous 3-bit down counter.   10

Or

VIII   (a)   Design T flip-flop using JK flip-flop and verify it using characteristic table and equation.   5

      (b)   Design a synchronous Mod-6 counter using JK flip flop.   10

Unit — IV

IX   Realize the following functions using a PAL with four inputs and 3-wide AND-OR structure along with the PAL programming table.

   $F_1 (A, B, C, D) = \Sigma m(6, 8, 9, 12, 13, 14, 15)$

   $F_2 (A, B, C, D) = \Sigma m(1, 4, 5, 6, 7, 10, 11, 12, 13)$

   $F_3 (A, B, C, D) = \Sigma m(4, 5, 6, 7, 10, 11)$

   $F_4 (A, B, C, D) = \Sigma m(4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15)$ 15

Or

X   (a)   Briefly explain the different specification parameters of DAC.   5

      (b)   Using appropriate example explain error detection and correction using hamming code.   10