



TED (15) – 3133

Reg. No.....

(REVISION — 2015)

Signature .....

**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 ?

(5×2 = 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.

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

2. Design a full adder circuit using two half adders. Realize it using logic diagram and block diagram.
3. Minimize the expression  $F(X, Y, Z) = \sum(0, 2, 3, 4, 5, 6)$  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.

(5×6 = 30)



## 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)  $\overline{AB(CD + EF(\bar{A}B + \bar{C}D))}$  (ii)  $\overline{\bar{A}B + \bar{A} + AB}$  5

## UNIT — II

V (a) Minimize the following expression using K-map :  
 $F(W, X, Y, Z) = \sum(1, 4, 7, 10, 13) + \sum d(5, 14, 15)$  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 :  
 $F(A, B, C, D) = \sum(4, 5, 7, 12, 14, 15) + \sum d(3, 8, 10)$  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.

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

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

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

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

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