TED (15) – 3133

(REVISION — 2015)

Reg. No..

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) $F(X, Y, Z) = (X + Y)(Y + Z)$ (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. (5×6 = 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) $\overline{\bar{A}\bar{B}\,(CD + \bar{E}F(\bar{A}\bar{B} + \bar{C}\bar{D}))}$ (ii) $\overline{\bar{A}\bar{B} + \bar{A} + AB}$ 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