

Time: 3 hour

Max marks 80

- N.B.:** (1) Question 1 is compulsory.
 (2) Attempt any 3 out of remaining 5 questions
 (3) Assume suitable data if required.
 (4) Figures to the right indicate full marks.

Q1. Solve any four

- a) Prove that NAND and NOR are universal gates 05
 b) Why and which code is used for labelling the cells of K-map 05
 c) Perform the following operation using 2's complement method 05
 (i) $(7)_{10} - (15)_{10}$ (ii) $(50)_{10} - (2A)_{16}$
 d) Write a VHDL code for 4-bit adder 05
 e) What is Race around condition in JK FF how to overcome it 05

Q 2 Solve the following

- a) Convert SR flip flop to JK Flip flop 10
 b) Minimize the following function using Quine MC-Cluskey 10

$$f(A, B, C, D) = \sum m(1, 3, 7, 11, 15) + d(0, 2, 5)$$

Q 3 Solve the following

- a) Using Boolean algebra prove the following 10
 i) $AB + BC + A\bar{C} \leq AB + A\bar{C}$
 ii) $[(C + \bar{C}D)(C + \bar{C}\bar{D})][AB + A\bar{B}(A \text{ XOR } B)] = C$
 b) Convert following to decimal 10
 (i) $(352.7)_8$ (ii) $(458.54)_8$

Q .4 Solve the following

- a) What is shift register? Explain anyone type of shift register give its applications 10
 b) Design two-bit comparator and implement using logic gates 10

Q 5 Solve the following

- a) Design 3 bit binary to Gray code converter circuit using logic gates 10
 b) Draw and explain a neat circuit diagram of BCD adder using IC 7483 10

Q.6. Solve the following

- a) Compare PAL with PLA 05
 b) Represent the following by Boolean expression by min/max terms. 05

$$Y(A, B, C, D) = (A + B + \bar{C})(\bar{A} + C + D)$$

 c) Design Full adder circuit using PLA 10