

**DipIETE – ET/CS**

Time: 3 Hours

**JUNE 2013**

Max. Marks: 100

**PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.**

**NOTE: There are 9 Questions in all.**

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

**Q.1 Choose the correct or the best alternative in the following: (2×10)**

a. In Boolean algebra  $a + ab = a$  is \_\_\_\_\_

- |                    |                    |
|--------------------|--------------------|
| (A) Involution Law | (B) De Morgan Law  |
| (C) Absorption Law | (D) Idempotent Law |

b. One of the following is equivalent to AND-OR realization is \_\_\_\_\_

- |                          |                           |
|--------------------------|---------------------------|
| (A) NAND-NOR realization | (B) NOR-NOR realization   |
| (C) NOR-NAND realization | (D) NAND-NAND realization |

c. The number of cells in a 4-variable K-map is \_\_\_\_\_

- |       |        |
|-------|--------|
| (A) 4 | (B) 16 |
| (C) 8 | (D) 64 |

d.  $J$ - $K$  flip-flop is made to toggle in one of the following condition \_\_\_\_\_

- |                    |                    |
|--------------------|--------------------|
| (A) $J = 0, K = 0$ | (B) $J = 1, K = 0$ |
| (C) $J = 0, K = 1$ | (D) $J = 1, K = 1$ |

e. A shift register which can enter the data into it only one bit at a time, but has all data bits available as outputs is \_\_\_\_\_

- |                              |                                |
|------------------------------|--------------------------------|
| (A) Serial In / Serial Out   | (B) Serial In / Parallel Out   |
| (C) Parallel In / Serial Out | (D) Parallel In / Parallel Out |

- f. The switching function  $f = \sum m(1,2,4,8,10,14)$  is implemented by using \_\_\_\_\_ decoder
- (A) 4 x 16 (B) 3 x 8  
(C) 2 x 4 (D) 5 x 32
- g. A Flip-Flop has two outputs which are \_\_\_\_\_
- (A) always zero (B) always one  
(C) always complementary (D) in one of the above status
- h. Gray Code is:
- (A) non-weighted code (B) adjacent code differ by one bit  
(C) reflected code (D) all of these
- i. An example of canonical SOP is \_\_\_\_\_
- (A)  $ABC + BC + AB$  (B)  $AB$   
(C)  $ABC + AB$  (D)  $A\bar{B}C + ABC$
- j. The memory which can be programmed by the user and then cannot be erased and reprogrammed is \_\_\_\_\_
- (A) ROM (B) PROM  
(C) EPROM (D) EEPROM

**Answer any FIVE Questions out of EIGHT Questions.  
Each question carries 16 marks.**

- Q.2** a. Perform the following conversions
- (i)  $(7825.6875)_{10} = (?)_8$   
(ii)  $(A4F)_{16} = (?)_8$   
(iii)  $(3F2A)_{16} = (?)_2$   
(iv)  $(546)_8 = (?)_{16}$  (8)
- b. Compare Analog and Digital systems. Explain the advantages and disadvantages of digital systems over analog systems. (8)
- Q.3** a. Implement two input EX-OR gate using minimum number of two input NOR gates only. (4)
- b. Simplify the Boolean function  $f(w, x, y, z) = \sum(0,1,6,7,14,15) + \sum d(3,4,11,12)$  by using the don't care conditions "d" in
- (i) SOP Form  
(ii) POS Form (8)

- c. Find the simplified complemented expression for the function  
 $f(A, B, C) = ABC + ABC + \overline{ABC} + \overline{ABC}$  (4)
- Q.4** a. Explain the working of JK Flip Flop with the help of its logic diagram, characteristic equation, state table and excitation table. (8)
- b. Describe the working of 4 bit Serial In Serial Out Shift Register using logic diagram and waveforms. (8)
- Q.5** a. Represent  $(275)_{10}$  and  $(641)_{10}$  in BCD and then perform BCD addition. Verify the answer by converting back to decimal. (4)
- b. Describe the working of a five bit parallel Binary adder circuit using full adders. (8)
- c. Compute the following using 2's complement arithmetic  
(i)  $-9 - 4$  (ii)  $-4 + 9$  (4)
- Q.6** a. Explain the operation of a 4 bit Asynchronous Up Counter using JKFF, with the help of logic diagram and waveforms. (8)
- b. Design a MOD 5 Synchronous Counter using D Flip Flops. (8)
- Q.7** a. Draw and explain the logic circuit and truth table for an Octal to Binary Encoder. (8)
- b. Design a 1 line to 8 line demultiplexer. (8)
- Q.8** a. Distinguish between Serial in /Parallel out and Parallel in/Serial out shift registers. (8)
- b. Design a three bit serial in serial out shift register using JKFF. (8)
- Q.9** a. Describe the timing diagrams for read cycle and write cycle for static RAM. (8)
- b. Write a short note on the following:  
(i) Static memory device (ii) Dynamic memory device  
(iii) Access time (iv) External memory (8)