

DiplETE – ET/CS (Current & New Scheme)

Time: 3 Hours

June 2018

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. Nibble is a group of _____
 (A) 8 bits (B) 4 bits
 (C) 3 bits (D) 2 bits
- b. DeMorgan's first theorem is _____
 (A) $\overline{X.Y} = \overline{X} + \overline{Y}$ (B) $\overline{X+Y} = \overline{X}. \overline{Y}$
 (C) $\overline{X} + \overline{X} = 0$ (D) $\overline{X}.X = 0$
- c. A Karnaugh map with 3 variables has _____
 (A) 2 cells (B) 8 cells
 (C) 16 cells (D) 4 cells
- d. The BCD number for decimal 185 is _____
 (A) 111011010 (B) 110001110011
 (C) 10111001 (D) 000110000101
- e. The output of a gate is high if all the inputs are high. Then it is a
 (A) NAND (B) AND
 (C) EX-OR (D) OR
- f. The number of flip-flops required to implement a divide by 64 is _____
 (A) 64 (B) 32
 (C) 16 (D) 6
- g. 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

- h. A combinational circuit has _____
 (A) only memory elements
 (B) only non memory elements
 (C) both memory and non memory elements
 (D) less memory elements
- i. Alphanumeric codes are _____
 (A) Un-weighted codes (B) 8-4-2-1 codes
 (C) Weighted codes (D) None of these
- j. A shift register which can enter the data into it only one bit at a time, but has all the data bits available as an output is _____
 (A) Serial In / Serial Out (B) Serial In / Parallel Out
 (C) Parallel In / Serial Out (D) Parallel In / Parallel Out

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

- Q.2** a. What is a digital system? Explain its advantages and disadvantages over analog systems. (8)
- b. Convert the following binary numbers to their equivalent decimal values. (4)
 (i) $(11001)_2$ (ii) $(1001.1001)_2$
- c. Convert the following decimal numbers to their equivalent binary numbers. (4)
 (i) $(83)_{10}$ (ii) $(127)_{10}$
- Q.3** a. Find the simplified complemented expression for the following function (4)
 $F(A,B,C) = ABC + AB\bar{C} + \bar{A}BC + \bar{A}\bar{B}C$
- b. Why NAND and NOR gates known as universal gates? Draw AND, OR and NOT gates realization using NAND and NOR gates. (8)
- c. Simplify the following boolean function using K'Map (4)
 $F(A,B,C,D) = \sum(0,1,2,4,5,6,8,9,12,13,14)$
- Q.4** a. Explain the application of Flip-Flop as a Shift Register using D Flip-Flops. (8)
- b. Draw the logic diagram of JK Flip Flop and explain its working using truth table. (8)
- Q.5** a. (i) Perform the addition of +25 to -15 using 2's complement system. (4)
 (ii) Perform the subtraction of $0011.1001 - 0001.1110$ using 2's Complement System. (4)
- b. Write the SOP expressions for the Sum(S) and C_{out} of a full-adder. Use a Karnaugh-map to minimize the expressions and then implement them with inverters and AND-OR logic. (8)

- Q.6** a. What is an Asynchronous Counter? Draw the logic diagram of MOD-10 Asynchronous Counter and explain its working with the help of timing diagrams. (8)
- b. What is a Synchronous Counter? Draw the logic circuit of Synchronous MOD 16 Down Counter and explain its working with timing waveforms. (8)
- Q.7** a. What is an encoder? Draw the logic circuit of Decimal to BCD encoder and explain its working. (8)
- b. What is Magnitude Comparator? Explain 2-bit Magnitude Comparator with the help of truth table. (8)
- Q.8** a. Draw the logic diagram for 4-bit Serial-in to Parallel-out Shift Register and explain its working with timing waveforms. (7)
- b. Design a Mod-6 Synchronous Counter and draw its designed logic diagram. (9)
- Q.9** a. Draw and explain the architecture of 16×8 ROM. (8)
- b. Explain the reading and writing operations in a DRAM cell. (8)