

**END TERM EXAMINATION****SECOND SEMESTER [BCA] MAY-JUNE 2018****Paper Code: BCA106****Subject: Digital Electronics****Time : 3 Hours****Maximum Marks :75**

**Note: Attempt any five questions including Q.no.1 which is compulsory.  
Select one question from each unit.**

- Q.1 Attempt all the questions:- (5x5=25)**
- Why are NAND and NOR gates known as universal gates? Implement half adder circuit using NAND gates only.
  - Define the terms for digital circuits:
    - Speed of operations,
    - Figure of Merit
    - Noise margin.
  - What is De-multiplexer? Explain the difference between MUX and DEMUX.
  - What is the major disadvantage of SR flip-flop? How is this addressed in JK Flip-Flop?
  - Explain ripple counter. What's the difference between ripple counter and synchronous counter?

**Unit-I**

- Q.2**
- Explain deMorgan's theorem. Prove the following using De Morgan's theorem:
    - $AB + CD = \overline{A\overline{B}}\overline{C\overline{D}}$  and (ii)  $(A + B).(C + D) = \overline{(\overline{A + B}) + (\overline{C + D})}$
  - Implement EX-OR and EX-NOR gate using only NOR gates
- Q.3**
- Explain the term "logic family". Compare RTL and TTL logic.
  - Simplify the following expression using K-map:
 
$$Y = m_0 + m_1 + m_3 + m_7 + m_8 + m_9 + m_{11} + m_{15}$$
  - Prove the relationship:
    - $\overline{A}.B.C + A.\overline{B}.C + A.B.\overline{C} + A.B.C = A.B + B.C + C.A$
    - $A.\overline{B} + A.B + B.C = A + B.C$

**UNIT-II**

- Q.4**
- Explain even parity and odd parity. Design a circuit for even parity generator for 3-bit message.
  - Show block diagram of a 3 bit parallel binary adder.
  - Explain the binary multiplication method using the example (1010x1011)
- Q.5**
- Implement the expression using a multiplexer
 
$$f(A, B, C, D) = \sum m(0, 2, 3, 6, 8, 9, 12, 14)$$
  - Design a 3:8 decoder using basic logic gates.

**Unit III**

- Q.6**
- Design a S-R latch using 2-input NOR gates
  - Explain (a) J-K Flip-Flop can be converted to T Flip-Flop, (b) race around condition.
  - Explain master-slave flip-flop
- Q.7**
- Justify the statement: "J-K Flip-Flop is a universal Flip-Flop.
  - Explain the advantage of SIPO over SISO. Discuss their applications.
  - What is Bi-directional Flip-Flop?

Unit-IV

- Q.8 (a) How ripple counter works? 2.5  
(b) Show state diagram of 3 bit up/down counter. Design 3 bit up/down counter using T flip-flop. 7.5  
(c) Define ring counter 2
- Q.9 Write short notes on any two of the following: (6.25x2=12.5)  
(i) RAM & ROM  
(ii) PLA  
(iii) Modulo counters

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