## MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

## III SEMESTER B.Tech.(BME) DEGREE END SEM EXAMINATIONS NOV/DEC 2016 SUBJECT: DIGITAL ELECTRONICS (BME 2103) (REVISED CREDIT SYSTEM)

Wednesday, 30th November 2016, 9AM to 12 NOON

## TIME: 3 HOURS

## MAX. MARKS: 100

06

- 1. Answer all FIVE full questions.
- 2. Draw labeled diagram wherever necessary
- (A) Design a 4-bit 2's complement subtractor circuit (both positive & negative difference in 06 one circuit) using ICs 7483 and additional gates (if required).
  - (B) Design a 4-bit twisted ring counter using a 4-bit universal bidirectional shift register 08 (IC 74194).
  - (C) Design a full adder using 4:1 Multiplexers (IC 74153).
- 2. (A) Design a Moore sequential circuit using D flip-flops, which detects a non-overlapping 08 sequence 101 from an input sequence.
  - (B) Design a decoder circuit for common cathode seven segment display to display decimal 06 numbers from 0 to 3.
  - (C) Realize a one digit BCD adder using 7483 ICs. Describe how the BCD adder circuit 06 detects the need for a correction and executes it.
- 3. (A) Construct the state diagram for a Mealy sequential circuit that will detect an overlapping 04 sequence "1001" from an input sequence.
  - (B) What is a digital comparator? Realize an 8-bit comparator using ICs 7495. 08
  - (C) Design a decade synchronous counter using JK Flip-flops. 08
- 4. (A) Simplify the Boolean function  $F(A, B, C, D) = \sum m (3, 6, 7, 9, 11, 12, 13, 14, 15)$  and 04 realize it using only NOR gates.

(B) Design an Excess-3 to BCD code converter using

(i) 2 dual 4:1 multiplexers (ICs 74153) and additional gates.

- (ii) 4 to 16 line decoder (IC 74154) and additional gates.
- (C) (a) Perform the following arithmetic operations of hexadecimal numbers:

(i)  $(DF)_{16} + (AC)_{16}$  (ii)  $(C3)_{16} + (0B)_{16}$ 

(b) Perform the addition of the following BCD numbers:

(i) 0110 0111 and 0101 0011 (ii) 0100 0100 1000 and 0100 1000 1001

- (c) A computer system uses a 20-bit address code to identify each of over 1 million binary locations.
  - (i) How many hex-characters are required to identify the address of each memory location?
  - (ii) What is the hex-address of the 200<sup>th</sup> memory location?
- (d) Digital thermometers use BCD to drive their digital displays.
  - (i) How many BCD bits are required to drive a 3-digit thermometer display?
  - (ii) What are the BCD bits sent to the display, to display the temperature 147°C?
- 5. (A) Simplify the following 5-variable Boolean function using "Karnaugh Map": 06 F (A, B, C, D, E) =  $\sum m (0, 1, 2, 3, 6, 7, 11, 15, 16, 17, 19, 23, 27, 31)$ 
  - (B) Realize a 3-bit Parallel-in Serial-out (PISO) / Parallel-in Parallel-out (PIPO) Shift 06
    Register using D Flip-flops.
  - (C) (a) Design a Mod-6 Ripple counter using JK Flip-flops. Draw the timing diagram.(b) A 3-bit ripple counter uses Flip-flops with propagation delay of 20ns each. What will be the maximum time required for change of state?

(c) What is the output frequency (at MSB output) of a ripple decade counter, clocked from a 50 kHz signal?

**08** 

08