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MANIPAL INSTITUTE OF TECHNOLOGY

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III SEMESTER B.Tech.(BME) DEGREE MAKE-UP EXAMINATIONS DEC/JAN 2016-17 SUBJECT: DIGITAL ELECTRONICS (BME 2103) (REVISED CREDIT SYSTEM) Monday, 2nd January 2017, 9 am - 12 Noon

TIME: 3 HOURS

MAX. MARKS: 100

Instructions to Candidates:

Answer all questions.

- (A) Design a 4-bit 1's complement subtractor circuit (both positive & negative difference in 06 one circuit) using ICs 7483 and additional gates.
 - (B) Design a circuit that generates the sequence 0, 1, 2, 4, 9, 3, 7, 0 using a 4-bit universal 08 bidirectional shift register (IC 74194) and additional gates.
 - (C) Design a 3-bit binary to gray code converter using 4:1 Multiplexers (ICs 74153) and 06 additional gates.
- (A) Design a Mealy sequential circuit using D flip-flops, which detects a non-overlapping 08 sequence 101 from an input sequence.
 - (B) Design a decoder circuit to display octal numbers using the common-cathode type seven- 06 segment display used in Biomedical equipments.
 - (C) What is a parity bit? Mention its significance. Design a 3-bit Even-parity Generator / 06 Checker.
- 3. (A) Construct the state diagram for a Moore sequential circuit that will detect an overlapping 04 sequence "1010" from an input sequence.
 - (B) What is a digital comparator? Design a 2-bit digital comparator. 08
 - (C) Design a 4-bit synchronous counter using JK Flip-flops.
- 4. (A) Simplify the Boolean function $f(A B C D) = \overline{A} \overline{B} \overline{C} + \overline{B} C \overline{D} + \overline{A} B C \overline{D} + A \overline{B} \overline{C}$, using 04 KMap. Realize the simplified function using only NAND gates.

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- (B) Design a full adder circuit using:
 - (i) 3 to 8 line decoder. (ii) 4:1 Multiplexers
- (C) (a) Perform the following arithmetic operations of hexadecimal numbers:

(i) $(2B)_{16} + (84)_{16}$ (ii) $(84)_{16} - (2A)_{16}$

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

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

- (c) What is the maximum count of a two-digit, three-digit, and four-digit hexadecimal number? Express in hexadecimal as well as decimal.
- (d) Represent the decimal number 2048 in
 - (i) binary (ii) BCD code (iii) Excess-3 code (iv) Gray code
- 5. (A) Simplify the following 5-variable Boolean function using "Karnaugh Map": 06 $F(A, B, C, D, E) = \sum m (0, 5, 6, 8, 9, 10, 11, 16, 20, 24, 25, 26, 27, 29, 31)$
 - (B) Realize a 3-bit Serial-in Serial-out (SISO) / Serial-in Parallel-out (SIPO) Shift Register 06 using D Flip-flops.
 - (C) (a) Design a Mod-11 Ripple counter using JK Flip-flops.

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(b) A 10-bit ripple counter uses Flip-flops with propagation delay of 25ns each. What will be the maximum time required for change of state?

(c) What is the output frequency (at MSB output) of a ripple Mod-11 counter, clocked from a 50 kHz signal?

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