Reg. No.											

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

III SEM B.Tech (BME) DEGREE END SEMESTER EXAMINATIONS, NOV/DEC 2018.

SUBJECT: DIGITAL ELECTRONICS (BME 2103)
(REVISED CREDIT SYSTEM)
Tuesday, 27th November, 2018, 9 to 12 Noon

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to Candidates:

1. Answer ALL questions.
2. Draw near labeled diagrams wherever necessary.

1A. The input and output sequences of a sequence detector are given below: 05

Input: 01101010 Output: 00000101

Construct the state diagrams (both Mealy and Moore type) for the sequence detector. Give the comparison between Mealy and Moore machines.

1B. (i) What is the maximum delay in a 10-bit binary ripple counter that uses flip-flops with a delay of 20ns each? What is the maximum frequency the counter can operate at reliably? 05

(ii) How many flip-flops must be complemented in a 10-bit binary ripple counter to reach the next count after 0111111111?

(iii) Design a 1 digit BCD ripple counter using suitable Flip-flops that trigger on the negative edge.

2A. Design a 3-bit Gray-code synchronous counter using JK Flip-flops. 05

2B. Design a 6-bit Adder/Subtractor circuit with a control input to select between addition and subtraction. 05

3A. i) What range of decimal values can be represented by a four-digit Octal number? 04

(ii) Solve the following equation for X: $X_{16} = 0011\ \ 1011\ \ 0111\ \ 1010_2$

(iii) The binary equivalent of decimal number 0.0625 is:

(iv) The state of a 12-cell register is 010110010111. What is its content if it represents (a) three decimal digits in BCD, (b) three decimal digits in Excess-3 code, (c) three decimal digits in 2421 code.

3B. Give the exact operation of 7447 BCD to 7-Segment decoder/driver IC. 06

4A. Obtain the minimum sum of products (SOP) expression using Karnaugh map for the following Boolean function/expression. 07

$(a)\ f(w,x,y,z) = \sum m\ (0,2,6,8,10,12,14)$

(b) $y = \bar{A}\bar{B}\bar{C}\bar{D}E + \bar{A}\,\bar{B}\,C\bar{D}E + \bar{A}B\bar{C}\bar{D}\bar{E} + \bar{A}\,B\bar{C}DE + A\bar{B}\bar{C}\bar{D}E + A\bar{B}C\bar{D}E + AB\bar{C}\bar{D}\bar{E}$

4B. Simplify the following expressions using Boolean algebra and De-Morgan's theorems. 03

$(a)\ y = \bar{A} + \bar{B} + \overline{\left(\overline{A.\bar{C}} + \bar{B}\right)} + C$

(b) $y = \overline{\left(\overline{A.\bar{B}} + \bar{C}\right)} + \overline{\left(\bar{A} + \overline{\bar{B}.\bar{C}}\right)}$

5A. (i) The content of a 4-bit shift register is initially 1101. The register is shifted six times to the right, with the serial input being 101101. What is the content of the register after each shift? 05

(ii) Give the function table associated with a universal bidirectional shift register IC 74194 and design a 4-bit Johnson counter using the same.

5B. Design a Full adder circuit using each of the following and compare the two circuits. 05

(a) 8:1 MUXs, and (b) 3 to 8 line decoder