CBCS SCHEME

USN | | | | | | | | | | |

18EC34

Third Semester B.E. Degree Examination, Aug./Sept.2020
Digital System Design

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Place the following equations into proper canonical forms:
i) $f(abc) = a\bar{b} + a\bar{c} + bc$
ii) $f(abcd) = (a + \bar{b})(a + \bar{b} + d)$ **(06 Marks)**

b. Identify all the prime implicants and essential prime implicants of the Boolean function using K-map.
$f(abcd) = \Sigma(0, 1, 2, 5, 6, 7, 8, 9, 10, 13, 14, 15)$ **(06 Marks)**

c. Find the minimal sum and minimal product for the function using K-map.
$f(abcd) = \Sigma(6, 7, 9, 10, 13) + \Sigma d(1, 4, 5, 11, 15)$ **(08 Marks)**

OR

2 a. Represent the number of days in a month for a non-leap year by a truth table, indicating the output of invalid input if any by '0'. **(05 Marks)**

b. Find all the prime implicants of the function using Quine-McClusky method.
$f(abcd) = \Sigma(7, 9, 12, 13, 14, 15) + d(4, 11)$ **(10 Marks)**

c. Simplify the given Boolean equation using K-map:
$f(abcd) = \pi(1, 2, 3, 4, 9, 10) + \pi d(0, 14, 15)$ **(05 Marks)**

Module-2

3 a. Implement full subtractor using 74138 decoder. **(06 Marks)**

b. Design 2-bit magnitude comparator. **(08 Marks)**

c. Implement Boolean function using 8:1 MUX treat a, b, c as select lines:
$f(abcd) = \Sigma(0, 1, 5, 6, 7, 9, 10, 15)$ **(06 Marks)**

OR

4 a. Implement the Boolean function $f(abcd) = \Sigma(0, 2, 4, 5, 7, 9, 10, 14)$ using multiplexers with two 4:1 MUX with variable a, d connected to their select lines in the first level and one 2:1 MUX with variable 'C' connected to its select lines in the second level. **(10 Marks)**

b. Implement Boolean function $f(abcd) = \Sigma(4, 5, 7, 8, 10, 12, 15)$ using 4:1 MUX and external gates:
(i) a, b are connected to select line a_1 a_0 respectively
(ii) c, d are connected to select lines a_1 a_0 respectively. **(10 Marks)**

Module-3

5 a. Explain the operation of switch debouncer using SR latch with the help of circuit and waveforms. **(07 Marks)**

b. Explain Master Slave JK F/F with the help of circuit diagram and waveforms. **(07 Marks)**

c. Design a 4-bit binary ripple-up counter using negative edge triggered JK flip-flop. **(06 Marks)**

OR

6 a. Explain positive edge triggered D-flip-flop with the help of circuit diagram and waveforms. **(08 Marks)**

b. Design a 4-bit universal shift register using positive edge triggered D-flip-flop and multiplexers to operate as indicated below:

Mode select	Operation
00	Hold
01	Right shift
10	Left shift
11	Parallel load

(08 Marks)

c. Write the difference between ripple counter and synchronous counter. **(04 Marks)**

Module-4

7 a. Design 3 bit synchronous up-counter using J-K flip-flop. **(10 Marks)**

b. Design a mod-6 synchronous counter using D-flip flop for the sequence 0-2-3-6-5-1. **(10 Marks)**

OR

8 a. Draw and explain block diagram of Moore model and mealy model. **(06 Marks)**

b. Design a synchronous circuit using positive edge triggered J-K flip-flop with minimal combinational gating to generate the sequence:
$0 - 1 - 2 - 0$ if input $x = 0$
$0 - 2 - 1 - 0$ if input $x = 1$
Provide an output which goes high to indicate the non-zero state in the sequence $0 - 1 - 2 - 0$. **(08 Marks)**

c. Design mod-5 synchronous counter using TF/F. **(06 Marks)**

Module-5

9 a. A sequential circuit has one input (x) and one output (z) the circuit examines groups of four consecutive inputs and produces an output z = 1 if the input sequence 0101 or 1001 occurs. The circuit resets after every four inputs. Find the mealy state graph typical sequence is 0101 0010 1001 0100. **(10 Marks)**

b. Explain with block diagram design and serial Adder with accumulator. **(10 Marks)**

OR

10 a. Write a short note on 4×4 bit binary parallel multiplication. **(10 Marks)**

b. List the guide lines for construction of state graphs. **(10 Marks)**

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