

CBCS SCHEME

17EC34

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

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Construct a truth table and write the Boolean output for a single output 2 which is to be true when the input variables a and b are true and when b is false, but a and c are true. Implement the Boolean expression using gates. (04 Marks)
- b. Convert the given Boolean function :
 - (i) $f_1 = f(a, b, c, d) = (a + \bar{b} + c)(\bar{a} + d)$ into maxterm canonical form
 - (ii) $f_2 = f(w, x, y, z) = w x + y z$ into minterm canonical form. (08 Marks)
- c. Identify the prime implicants and essential prime implicants for the following expression.
 - (i) $f(a, b, c, d) = \Sigma(1, 5, 7, 8, 9, 10, 11, 13, 15)$
 - (ii) $f(a, b, c, d) = \pi(0, 2, 3, 8, 9, 10, 12, 14)$ (08 Marks)

OR

- 2 a. Find the minimal sum and minimal product for the following Boolean function using Kmap.
 $Y = f(u, v, w, x) = \Sigma(1, 5, 7, 9, 13, 15) + \Sigma d(8, 10, 11, 14)$ (08 Marks)
- b. Simplify the following expression using Quine McCluskey method and find the minimal sum using PI reduction table.
 $f(a, b, c, d) = \Sigma(2, 3, 4, 5, 13, 15) + \Sigma d(8, 9, 10, 11)$ (12 Marks)

Module-2

- 3 a. Design a circuit that will find the 2's complement of a three bit binary number. Draw the logic diagram for the reduced equations. (08 Marks)
- b. Draw the logic diagram, function table and IEEE logic symbol of a 2 to 4 line decoder in 74139 IC. Realize the Boolean function $X = f(a, b, c) = (0, 3, 5, 6)$ using 74139. (12 Marks)

OR

- 4 a. Realize the following Boolean function using 4:1 multiplexer with a, b as select lines.
 $f(a, b, c, d) = \Sigma(0, 3, 4, 5, 7, 9, 13, 15)$ (06 Marks)
- b. Design a BCD adder using 7483. (06 Marks)
- c. Design a two bit magnitude comparator. (08 Marks)

Module-3

- 5 a. Explain the working of a SR latch as a switch debouncer with necessary circuit and timing diagram. (06 Marks)
- b. Explain the working of master slave JK flip flop with the help of a logic diagram, function table, logic symbol and timing diagram. (10 Marks)
- c. Explain race around condition and how it is overcome. (04 Marks)

OR

- 6 a. Explain with timing diagram for (i) SR flip flop and (ii) D flip flop. (06 Marks)
- b. Derive the characteristic equation for JK and T flip flop. (06 Marks)
- c. With a neat logic diagram, explain the working of positive edge triggered D flip flop. Also draw the timing diagram. (08 Marks)

Module-4

- 7 a. Design a register using four multiplexer and positive edge triggered D flip flop having the behavior specified in the table below.

S ₁	S ₀	Register operation
0	0	Hole
0	1	Synchronous clear
1	0	Complement contents
1	1	Circular shift right.

- b. Illustrate the operation of 4-bit binary ripple counter using positive edge triggered D flip flop without a count enable line. (08 Marks)
- c. Design a MOD 7 twisted ring counter. Write the logic diagram and counting sequence. (08 Marks)
- (04 Marks)

OR

- 8 a. Design a Mod 6 counter whose counting sequence is 000, 001, 100, 110, 111, 101, 000.... by using positive edge triggered JK flip flop. (10 Marks)
- b. Show how an 8 bit synchronous binary counter can be constructed from two 4 bit synchronous binary counters. (04 Marks)
- c. Explain PIPO and PISO shift register with relevant logic diagrams. (06 Marks)

Module-5

- 9 a. Explain the Mealy model and Moore model of a clocked synchronous sequential network. (08 Marks)
- b. Give the logic diagram shown in Fig.Q9(b).
 (i) Derive the excitation and output equations.
 (ii) Write the next state equations
 (iii) Construct a state transition table
 (iv) Draw the state diagram.

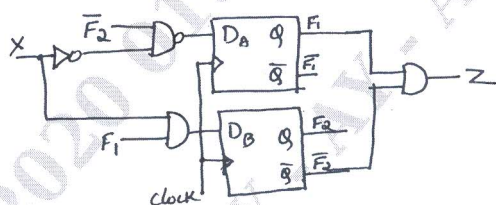


Fig.Q9(b)

(12 Marks)

OR

- 10 a. Construct mealy state diagram that will detect input sequence 10110, when input pattern is detected, Z is asserted high. Give state diagram for each state. (10 Marks)
- b. Design a sequential circuit for a state diagram shown in Fig.Q10(b) using JK flip flop.

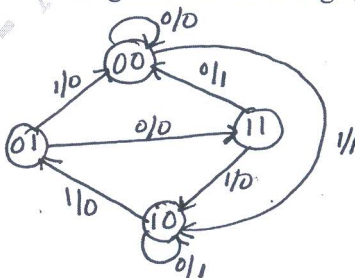


Fig.Q10(b)

(10 Marks)