Reg. No. : | | | | | | | | | | | |

M 2455

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Third Semester

Mechatronics Engineering

EC 154 — DIGITAL ELECTRONICS

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Convert the Boolean Expression.

   $A\overline{B}C + \overline{B}C\overline{D} + A\overline{C}D$ to a standard SOP form.

2. Simplify the expression using K-map

   $f(A, B, C, D) = \Sigma 0, 2, 3, 4, 6$.

3. Give the logic circuit of a half subtractor.

4. Differentiate an encoder and decoder.

5. What is a sequential circuit?

6. Give the truth-table for a rising-edge triggered JK flip-flop.

7. What is meant by race and critical race?

8. What is a pulse mode sequential circuit?

9. Name the various blocks of a ASM chart.

10. What is the purpose of ASM chart?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Simplify the Boolean function

$F(w, x, y, z) = \Sigma(0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14)$.

(ii) Implement the function

$F = x'y + xy' + z$ with only NOR gates.

Or

(b) (i) Simplify using tabulation method

$F = \Sigma(0, 1, 2, 8, 10, 11, 14, 15)$

(ii) Express the function as sum of minterms and a product of maxterm

$F(A, B, C, D) = D(A' + B) + B'D$

12. (a) (i) Implement a Fulladder using 2 half-adders.

(ii) Implement the given function with a multiplexer

$F(A, B, C, D) = \Sigma(0, 1, 3, 4, 8, 9, 15)$.

Or

(b) (i) Design a digital circuit to convert the BCD to Excess 3 code

(ii) Write notes on PLA.

13. (a) (i) Draw the logic diagram of a JK flip-flop and discuss its function deciding the characteristic table and hence its characteristic equation.

(ii) What is a shift register? Explain serial in and serial out shift register.

Or

(b) (i) What is meant by a synchronous counter?

(ii) Explain the operation of a BCD ripple counter with suitable logic diagram using JK flip flop.

14. (a) Design an asynchronous circuit with one level input x. The circuit is to serve as a modulo 4 counter, which counts the number of times the value of x changes from 0 to 1 and ignores the value of x changing from 1 to 0.

Or

(b) Realise the switching function with a static hazard-free two level AND-OR circuit.

(i) $f(x_1, x_2, x_3, x_4) = x_1x_2 + x_1'x_3x_4$

(ii) $f(x_1, x_2, x_3, x_4) = x_1'x_3 + x_2x_4 + x_1x_3'x_4'$.

15. (a) Realise an ASM chart for the function of a T flip-flop.

Or

(b) Given the state diagram, draw an equivalent ASM chart.