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

Question Paper Code: 51432

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Third Semester

Electronics and Communication Engineering

15UEC302 - DIGITAL ELECTRONICS AND DESIGN

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Which of the following logical operations is represented by the + sign in Boolean algebra?

   (a) Inversion (b) AND (c) OR (d) Complementation

2. For a 4-bit parallel adder, if the carry in is connected to a logic high, the result is

   (a) the same as if the carry-in is tied LOW since the least significant carry-in is ignored
   (b) that carry-out will always be high
   (c) a one will be added to the final result
   (d) the carry-out is ignored

3. How is a *J-K* flip-flop made to toggle?

   (a) $J = 0, K = 0$ (b) $J = 1, K = 0$ (c) $J = 0, K = 1$ (d) $J = 1, K = 1$

4. Define a race condition for a flip-flop

   (a) The inputs to a trigger device are changing slightly before the active trigger edge
   (b) The inputs to a trigger device are changing slightly after the active trigger edge
   (c) The inputs to a trigger device are changing at the same time as the active trigger edge
   (d) The inputs to a trigger device are not changing at the same time as the active trigger edge

5. The storage element for a static RAM is the

(a) diode (b) resistor (c) capacitor (d) flip-flop

PART - B (5 x 3 = 15 Marks)

6. List out the advantages and disadvantages of Quine-Mc Cluskey method.

7. What is binary decoder?

8. Define shift registers.

9. What is the difference between truth table and excitation table?

10. What is programmable logic array? How it differs from ROM?

PART - C (5 x 16 = 80 Marks)

11. (a) Using the K-Map method, simplify the following function, obtain their SOP and POS form $F(w, x, y, z) = \sum(1, 3, 4, 5, 6, 7, 9, 12, 13)$. (16)

Or

(b) Find the minimal sum of products for the Boolean expression, $f=\sum(1, 2, 3, 7, 8, 9, 10, 11, 14, 15)$, using the Quine-McCluskey method. (16)

12. (a) Construct a combinational circuit to convert given binary coded decimal number into an Excess 3 code. (16)

Or

(b) (i) Draw and explain the block diagram of a 4-bit serial adder to add contents of two registers. (8)

(ii) Explain the working of 4 bit ring counter. (8)

13. (a) Design a synchronous counter that goes through the sequence 0, 4, 7, 3, 2, 0 and repeat using JK flip flop. (16)

Or

(b) (i) Explain the operation of universal shift register with neat block diagram. (8)

(ii) Explain the working Master/Slave JK FF. (8)

14. (a) A sequential circuit with two D Flip-Flops, *A* and *B*; two inputs, *x* and *y*; and one output, *z*, is specified by the following next-state and output equations: $A(t+1) = x'y + xA$ $B(t+1) = x'B + xA$ $z = B$.

(i) Draw the logic diagram of the circuit.,

(ii) List the state table for the sequential circuit and

(iii) Draw the corresponding state diagram. (16)

Or

(b) Draw the K-Map for the function $F(A, B, C, D) = \Pi M(2, 3, 6, 8, 9, 12, 13, 14)$. Determine the minimized function in product of sums form. Are there any static-0 hazards in the minimized function? If yes, find them and eliminate them. (16)

15. (a) (i) Write short note on RAM and types of RAMs. (8)

(ii) Write a note on FPGA with neat diagram. (8)

Or

(b) Design using PAL the following Boolean functions:

(i) $W(A, B, C, D) = \Sigma(2, 12, 13)$

(ii) $X(A, B, C, D) = \Sigma(7, 8, 9, 10, 11, 12, 13, 14, 15)$

(iii) $Y(A, B, C, D) = \Sigma(0, 2,3, 4, 5, 6, 7, 8, 10, 11, 15)$

(iv) $Z(A, B, C, D) = \Sigma(1, 2, 8, 12, 13)$ (16)