No. of Printed Pages : 4

BICS-009

B.Tech. – VIEP – COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

Term-End Examination

00655

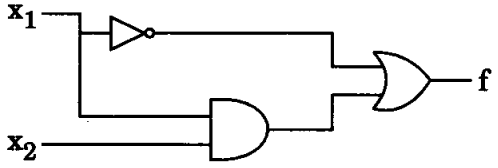
June, 2019

BICS-009 : LOGIC DESIGN

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks.*

1. (a) Draw the truth table for the following logic network :



Also find the boolean expression for 'f'. *2*

(b) Use boolean algebra to simplify the following boolean function : *3*

$$g = \overline{\overline{(x_1 + \bar{x}_2)} \cdot \overline{(\bar{x}_1 + \bar{x}_2)}}$$

(c) Simplify the following using K-map and draw the resulting logic diagram using AND, OR, NOT gates : *3*

$F(A, B, C, D) = \sum(0, 5, 6, 7, 8, 10, 11, 15)$

(d) What is the need of HDL ? List the basic features of any HDL. *2*

2. (a) Draw the truth table and logic circuit of a 2 to 4 decoder. Construct a 3 to 8 decoder using two 2 to 4 decoders and additional gates. *5*

(b) What is the role of parity bit ? Draw the logic circuit for a 5-bit even parity generator. *5*

3. (a) Add the following numbers using signed 2's complement notation. The size of number should be 8 bits. *3*

(i) $59 + (-75)$

(ii) $75 + (-59)$

(b) Draw the logic circuit of a half adder. *3*

(c) Explain the adder/subtractor unit with the help of a diagram. *4*

4. (a) Draw the logic circuit truth table and graphical symbol of clocked T-flip-flop. Explain the logic circuit of this flip-flop. *5*

(b) What are master-slave flip-flops ? Why are they needed ? *3*

(c) Differentiate between combinational and sequential circuits. *2*

5. (a) Explain the working of a 3-bit shift register, with the help of a diagram. Also show a sample sequence of shift of values through this register. *6*

(b) Differentiate between registers and counters. Can a counter be made using D-flip-flop ? Justify your answer. *4*

6. (a) Explain the use of state transition diagram with the help of an example/diagram. *4*

(b) List the steps of design of a sequential circuit. *4*

(c) What is meant by "edge-triggered flip-flops" ? *2*

7. What is the need of Analog to Digital Converter ? Explain with the help of an example. What are the basic performance issues for this conversion ? Explain the terms accuracy and resolution in this context. List the techniques of Analog to Digital conversion. *10*

8. Explain the characteristics of TTL circuits. List their advantages and disadvantages. Explain a fundamental TTL gate with the help of a diagram. *10*

9. Differentiate between the following : *5×2=10*

(a) Minterm and Maxterm

(b) Encoder and Decoder

(c) Signed 1's complement and Signed 2's complement notation of binary numbers

(d) T-flip-flop and D-flip-flop

(e) Serial and Parallel input to a register

10. Define the use of the following in the context of digital design (any ***five***) : *5×2=10*

(a) Don't care condition

(b) BCD

(c) Read-only memory

(d) Logic probe

(e) Fixed point numbers

(f) Decade counter

(g) Digital clock

(h) Programmable logic array