

Short Round Questions

1. Boolean Algebra

How many ordered quadruples make the following Boolean expression TRUE?

$$\overline{\overline{\overline{\overline{A+B+C+D}}}}(\overline{\overline{\overline{ABCD}}})$$

- A. 4
- B. 5
- C. 8
- D. 9
- E. None of the above

2. Bit-String Flicking

Let X be a 5 bit string.

Simplify the following expression:

$$(\text{LSHIFT-1}(\text{LCIRC-2 } 01010)) \text{ OR } (\text{RCIRC-1}(\text{LSHIFT-2 } X \text{ AND } 01110)) \\ \text{AND } (\text{LCIRC-2}(\text{NOT}(\text{LCIRC-2}(X \text{ OR } 01100))))$$

- A. 11010
- B. 10110
- C. 10011
- D. 10010
- E. None of the above

3. Recursive Functions

Find $f(20, 2)$ given :

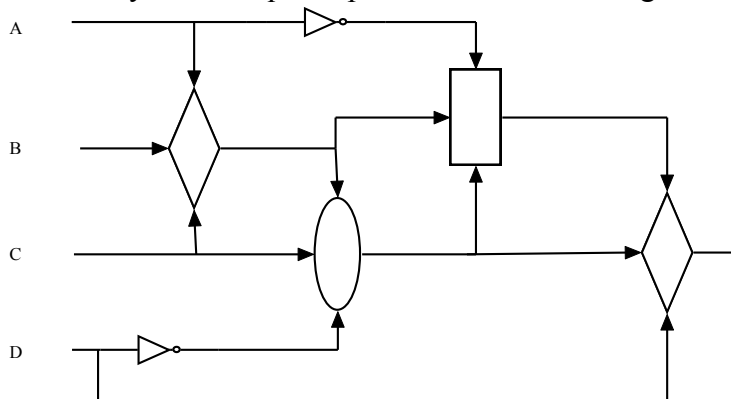
$$f(x, y) = \begin{cases} f(2y, x - 3) - 1 & \text{if } x > y \\ f(\lfloor y/2 \rfloor, x - 1) + 3 & \text{if } x < y \\ 4 & \text{if } x = y \end{cases}$$

- A. 6
- B. 7
- C. 9
- D. 10
- E. None of the above

Note : $\lfloor x \rfloor$ represents the greatest integer less than or equal to x

4. Digital Electronics

Define the following new gates: A *diamond* has 3 inputs and is TRUE if only 1 input is TRUE, an *oval* has 3 inputs and is TRUE if at most 1 input is TRUE, and a *rectangle* has 3 inputs and is TRUE if all inputs are TRUE. How many ordered quadruples make the following circuit TRUE?



- A. 1
- B. 3
- C. 9
- D. 13
- E. None of the above

<p>5. Prefix-Infix-Postfix</p> <p>Define $a \# b = a^2 - ab + b^2$ Evaluate this prefix expression. Note: all numbers are single digits.</p> $+ - / * 3 \# 0 2 2 * 2 3 / \# 4 - 8 6 * 3 2 \uparrow 2 4$	<p>A. 15 B. 20 C. 38 D. 56 E. None of the above</p>
<p>6. Computer Number Systems</p> <p>How many numbers from 100 to 200 in base 10 consist of distinct ascending digits and also have distinct ascending hex digits when converted to base 16?</p>	<p>A. 13 B. 14 C. 15 D. 16 E. None of the above</p>
<p>7. What Does This Program Do?</p> <p>What value is output when the following program is executed?</p> <pre> for x = 0 to 4 for y = 0 to 4 A(x,y) = (x+1) ^ 2 + y next y next x for x 0 to 4 for y = 0 to 4 if A(x,y) % 3 == 0 then A(x,y) = A(x,y) / 3 if A(x,y) % 4 == 0 then A(x,y) = A(x,y) / 4 if A(x,y) % 5 == 0 then A(x,y) = A(x,y) / 5 next y next x s = 0 for x = 0 to 4 for y = 0 to 4 if A(x,y) % 2 == 0 then s = s + A(x,y) next y next x output s </pre>	<p>A. 7 B. 20 C. 48 D. 58 E. None of the above</p>
<p>8. Data Structures</p> <p>Consider all binary search trees with 8 nodes. What is the smallest value for the internal path length?</p>	<p>A. 10 B. 13 C. 16 D. 19 E. None of the above</p>