GATE:EC-49-2022

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I. QUESTION

Consider a boolean gate(D) where output Y is related to the inputs A and B as, $Y = A + \overline{B}$, where + denotes logical OR operation. The Boolean inputs '0' and '1' are also available separately. Using instances of only D gates and inputs '0' and '1' (Select the correct options)

(A) NAND logic can be implemented
(B) OR logic cannot be implemented
(C) NOR logic can be implemented
(D) AND logic cannot be implemented

II. SOLUTION

If a NAND gate or NOR gate is implemented from the D-Gate, it will be a universal gate.
For NOT gate:

$$\overline{A} = Dgate\left(0, A\right) \tag{1}$$

For NAND gate:

$$\overline{A.B} = Dgate\left(Dgate\left(0, A\right), B\right) \tag{2}$$

Therefore D-gate is a universal gate and all logic gates specified in the options can be implemented making (A),(C) to be the right options.
Code for implementation through C onto Vaman-ARM.
https://github.com/Gandubs/Digital-Design/tree/master/Assignments/ec'22-49