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FUNCKIT

PROBLEM STATEMENT

ROUND-1

Free the
Captives!



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Conflict occurs when there is disagreement among individuals, groups, communities, and countries. This is a condition where people feel threatened physically, emotionally, or political level. This causes them to filter their perceptions based on their values, culture, beliefs, experience, and so on. Conflict, when resolved with level heads, leads to new and creative learning experiences. Otherwise, conflict can be catastrophic, leading to severe losses. When Russia went off the curtains of diplomacy and declared war, Ukraine was left in a dire situation. After the deployments, their denials and the diplomacy came the invasion and, with it, a thoroughly foretold war yet still shocking in its savagery—a hostile battle with no rules or limits.

Russia's war in Ukraine has stretched on for more than three weeks, a relentless bombardment of the country's cities and towns that has led to more than 700 civilian deaths, destroyed civilian infrastructure and forced more than 2.5 million people to flee Ukraine, creating a new humanitarian crisis in Europe.

The main reason for the conflict in Ukraine is political. After the dissolution of the USSR, Ukraine and Russia



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maintained close ties. When Ukraine acceded to the Treaty on the Non-Proliferation of Nuclear Weapons as a non-nuclear-weapon state, Russia, UK and USA agreed to uphold its territorial integrity and political independence. Several former Eastern Bloc countries applied for joining NATO. So did Ukraine. NATO ultimately issued a statement agreeing to accept this Ukraine. Putin voiced strong opposition to Ukraine's NATO membership bid. After months of protests, an interim government was established, just as Russia began its overt military campaign in Crimea. Leaders of Russian-speaking eastern regions of Ukraine declared continuing loyalty to Russia, causing the 2014 pro-Russian unrest in Ukraine. At the onset of its conflict, Russia had thousands of military personnel in the Black Sea Fleet, located in several localities throughout the Crimean peninsula. Russian presence was allowed by the basing and transit agreement with Ukraine. Early in the conflict, the agreement's sizeable troop limit allowed Russia to significantly reinforce its military presence under the plausible guise of security concern deploy special forces and other required capabilities to conduct the operation in Crimea. In 2019, Russia had already annexed Crimea and withdrew from the basing treaties unilaterally. In 2022, stating various excuses,



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Russia seeks to take over Ukraine and overthrow its democracy by declaring war.

Now, the people of Ukraine are stuck in the cold eternity of sirens and explosions rippling through their cities, as tanks and helicopters strafing their homes and livelihoods. After being caught in the Ukrainian siege, soldiers have been divided into small groups and are being held captive by Russian forces. The largest group of soldiers has the greatest chance of success to overpower their captors and escape. Help the soldiers by figuring out the most number of soldiers in one place.

Given a number n i.e. 4649, for example, will be represented as 1001000101001 in the binary format. Here, the Russian soldiers are represented by the 1's, whereas the 0's are the Ukrainian soldiers. Your task is to find the maximum number of Ukrainian soldiers in one place, i.e. 0's, which is 3 in this example.

Input: You are given 16 bit number in binary representation.



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Constraints:

$0 < n < 2^{16}$.

Test Cases:

1. $n=649$

Binary form: 1010001001

O/P=3.

2. $n=5145$

Binary form: 1010000011001

O/P = 5.

3. $n=5$

Binary form: 101

O/P = 1.

4. $n=63$

Binary form: 111111

O/P = 0.



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The participants are advised to make use of the following ICs for uniformity:

❖ COMPARATOR:

- 8 bit identity comparator - 74LS688
- 4 bit magnitude comparator - 74HC85

❖ BUFFER:

- Quadruple buffer gate with tri-state outputs - 74HC125
- Octal buffer with tri-state outputs - 74HC241

❖ FLIP FLOPS:

- Dual Positive Edge Triggered D-Type Flip-flops - 74LS74
- Quadruple D type Positive Triggered Flip-flops with clear 74LS175
- Octal D type Positive Triggered Flip-flops with clear - 74LS273
- Dual -K Positive Edge Triggered Flip-flops with clear and preset -74LS109

❖ MULTIPLEXER:

- Quadruple 1 of 2 data selectors/ Multiplexer - 74LS157



❖ COUNTERS:

- Synchronous 4-bit binary Counters 74LS161
- 8 bit binary Counter with tristate output registers 74LS590.
- 4 bit synchronous up/down Binary Counters- 74LS169

❖ ADDER:

- 4 bit Binary Full adders with fast carry - 74LS283

❖ MULTIPLIER:

- 4 bit multiplier with open collector outputs 74284, 74285

❖ REGISTER:

- 4 bit Shift Register -74179
- 4 bit bidirectional Universal Shift Registers - 74194

Weightage of various Components:

- Gates with 1 or 2 inputs – 1
- Gates with 3 or 4 inputs – 2
- Gates with more than 4 inputs -3
- 4-bit comparator - 11
- Buffer – 3
- Single Flip-flop-1
- Register(4-bit) – 4
- Register(8-bit) – 8
- MUX-8
- 4/8 bit counter – 6
- Multiplier(4 bit) 6
- Multiplier(8 bit) – 10
- Adder (4 bit) -4
- Adder (8 bit) -8

For any other component not mentioned above, the cost will be assigned on the spot.

Rules:

1. Use only the above mentioned ICs.
2. Submission of round 2 will be considered ,only if you complete round 1.
3. After the deadline, No submission will be considered.
4. Completion of 1st round is mandatory for the participation certificate. The top 3 teams will be eligible for certification of merit.



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Deadline: 23/04/2022 11:59 PM

Submit the simulation file named “team_name.zip” on the D2C portal .The ZIP file should contain the Proteus Design file, screen recording of the working of the circuit and a PDF file containing description of your approach and the number of each components used.

Note:

- Weightage of round 1 and round 2 is 30% and 70% respectively.
- There will be extra points for creativity.
- Try to minimize clock cycles and hardware requirements.

Feel free to contact us for any help:

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