

QUESTION No. 1

$$x = 0100$$

$$y = 1010$$

(i) $y + x = ?$

$$\begin{array}{r} 1010 \quad (y = -6) \\ 0100 \quad (x = 4) \\ \hline 1110 \quad (y+x = -2) \end{array}$$

(ii) $y - x = ?$

Two's complement of $x = 0100$

$$\begin{array}{r} 0100 \\ 1011 \\ + 1 \\ \hline \boxed{1100} \end{array}$$

Now

$$\begin{array}{r} 1010 \quad (y = -6) \\ 1100 \quad (x = -4) \\ \hline \text{discard } \textcircled{1} 0110 \quad (y-x = +6) \end{array}$$

The answer is invalid as $-6 - 4 \neq +6$.
So, we need more number of bits to accommodate -10 in its range. Let's assume that the given numbers are represented in 8-bit 2's complement notation.

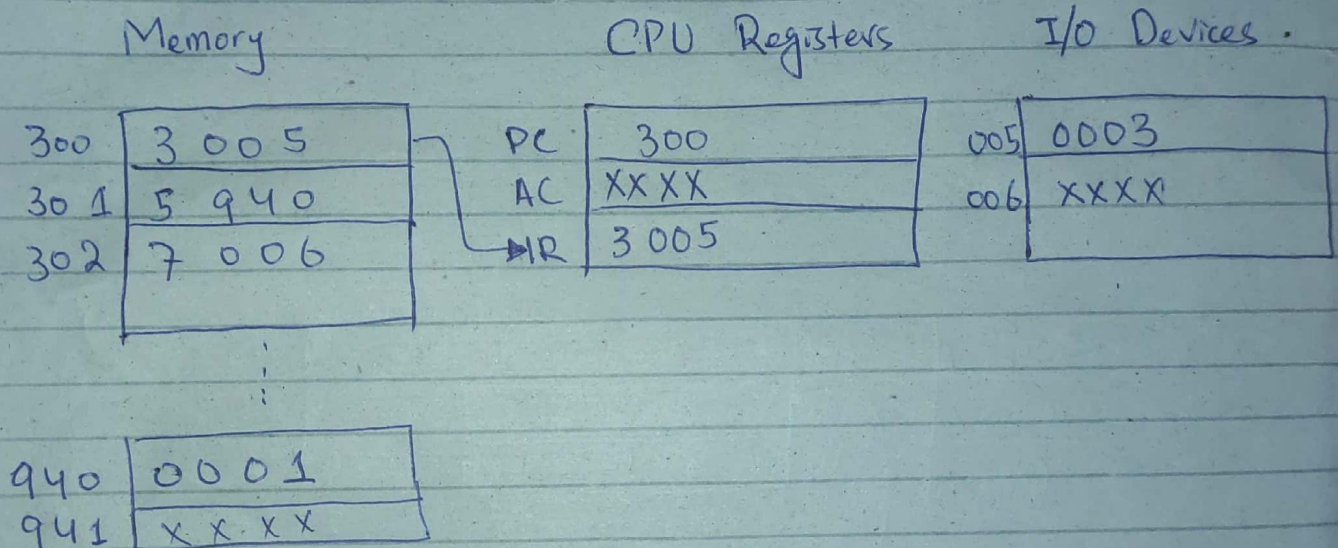
$$\begin{array}{rcl}
 11111016 & (y = -6) \\
 11111100 & (x = -4) \\
 \hline
 \text{discard } \textcircled{1} 11110110 & (y-x = -10)
 \end{array}$$

0011 = Load AC from I/O
 0111 = Store AC to I/O } → I/O Instructions opcodes

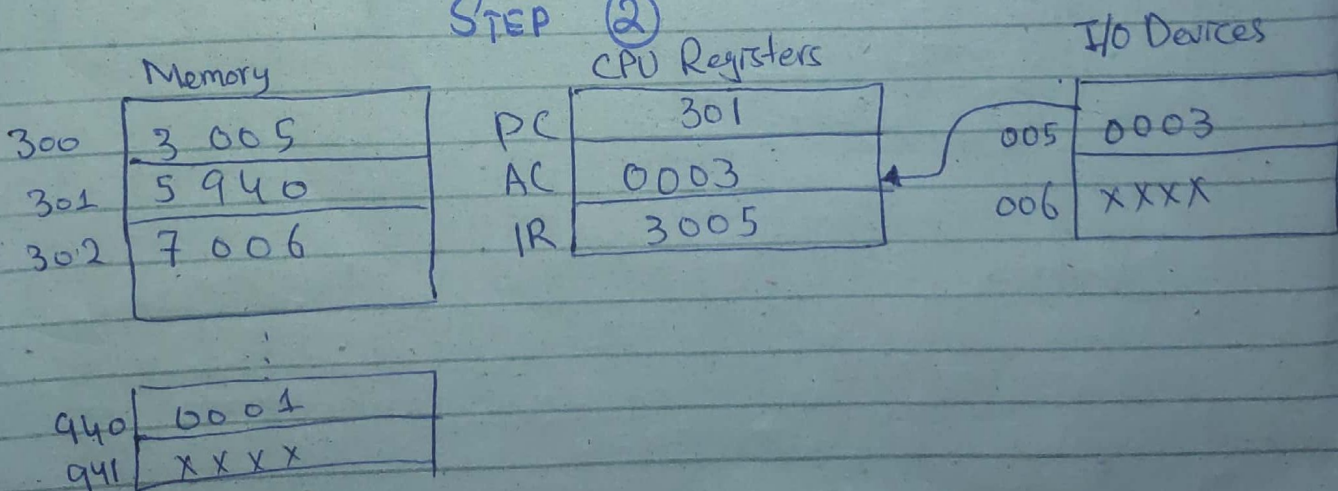
0001 = Load AC from Memory
 0010 = Store AC to Memory
 0101 = Add to AC from Memory } → CPU Supported Opcodes

SOLUTION:-

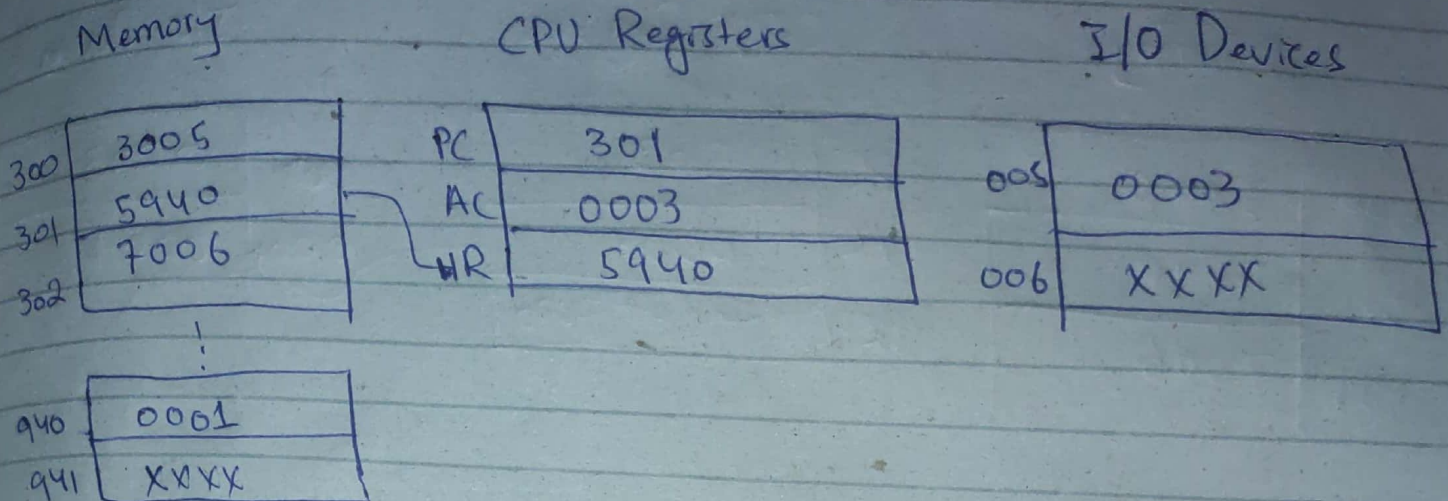
STEP ①



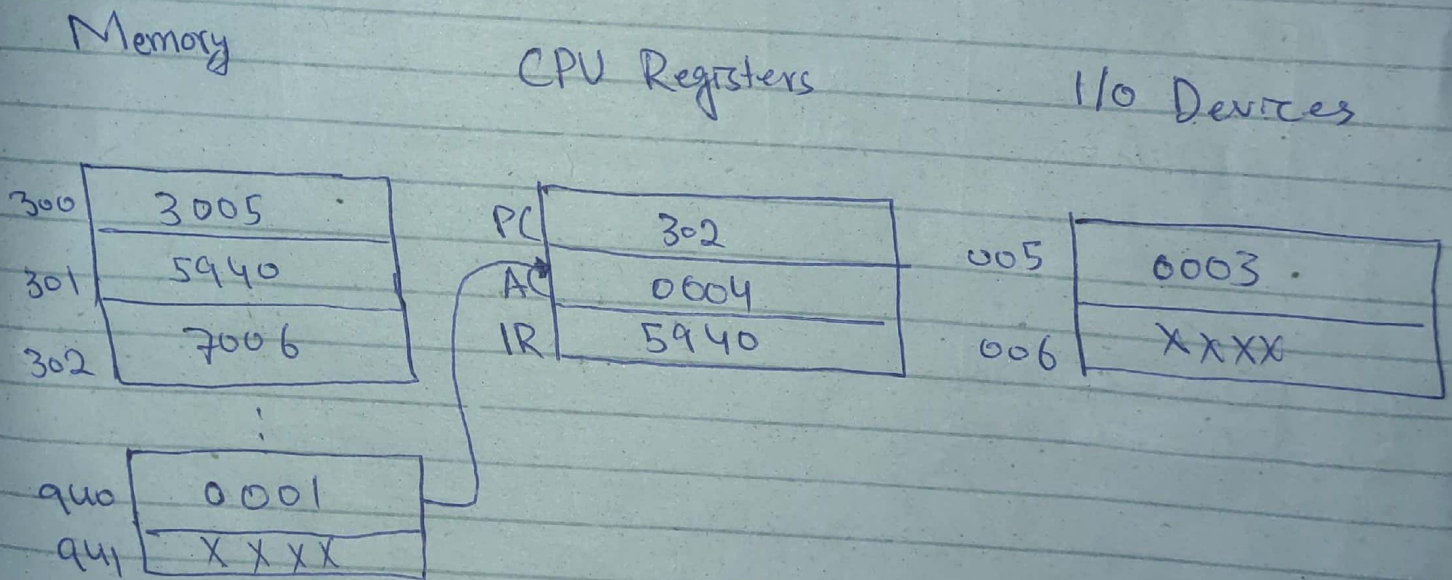
STEP ②



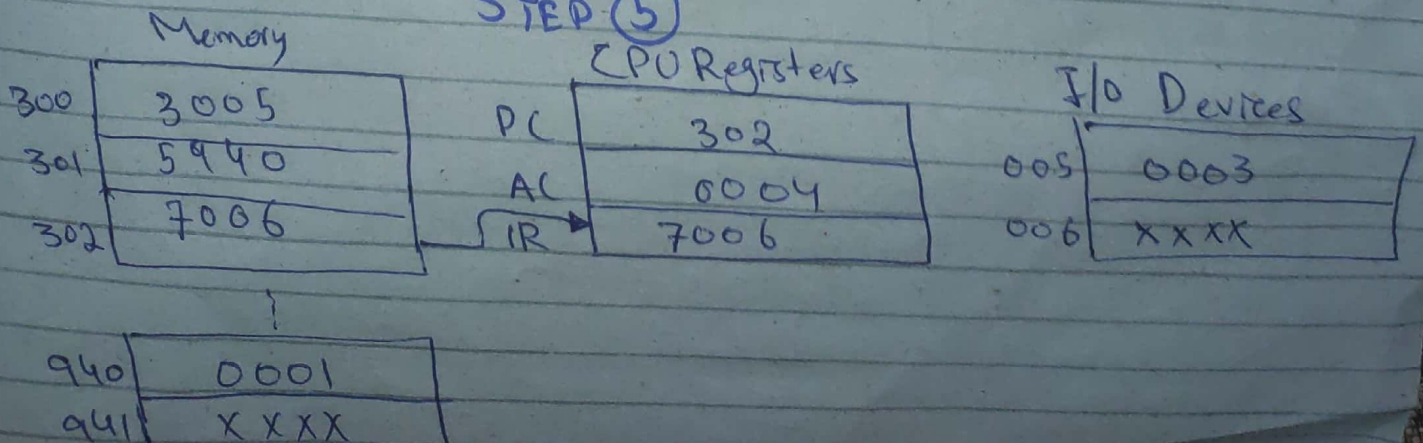
STEP ③



STEP ④



STEP ⑤



STEP ⑥

Memory

300	3 00 5
301	5 9 4 0
302	7 0 0 6

940	0 0 0 1
941	X X X X

CPU Registers

PC	303
AC	0004
IR	X X X X 7006

I/O Devices

0005	0003
0006	0004