

Question 25

a. i. Floating point numbers are presented in scientific notation i.e. $+011.1 \times 2^{010}$, ~~with~~ with a sign, a mantissa and an exponent. To ~~represent~~ represent a fraction a negative number is used as the exponent, therefore moving the decimal place to the left.

$$\text{ii. } 45_{10} = 32 + 8 + 4 + 1 \\ = 101101 \text{ base 2}$$

i.e. 00101101

which is 2D

in hexadecimal

0010 1101

2 13

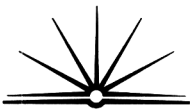
= 2D

$$\text{iii. } 1110 - 0111 = 1110 + (-0111)$$

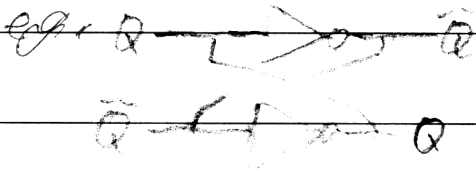
by 2's complement: ~~0111~~ 0111 = 1001

$$\therefore \text{The answer} = \del{1110} 1110 + 1001$$

Discarding the first 1 we are left with 10111 which is 14



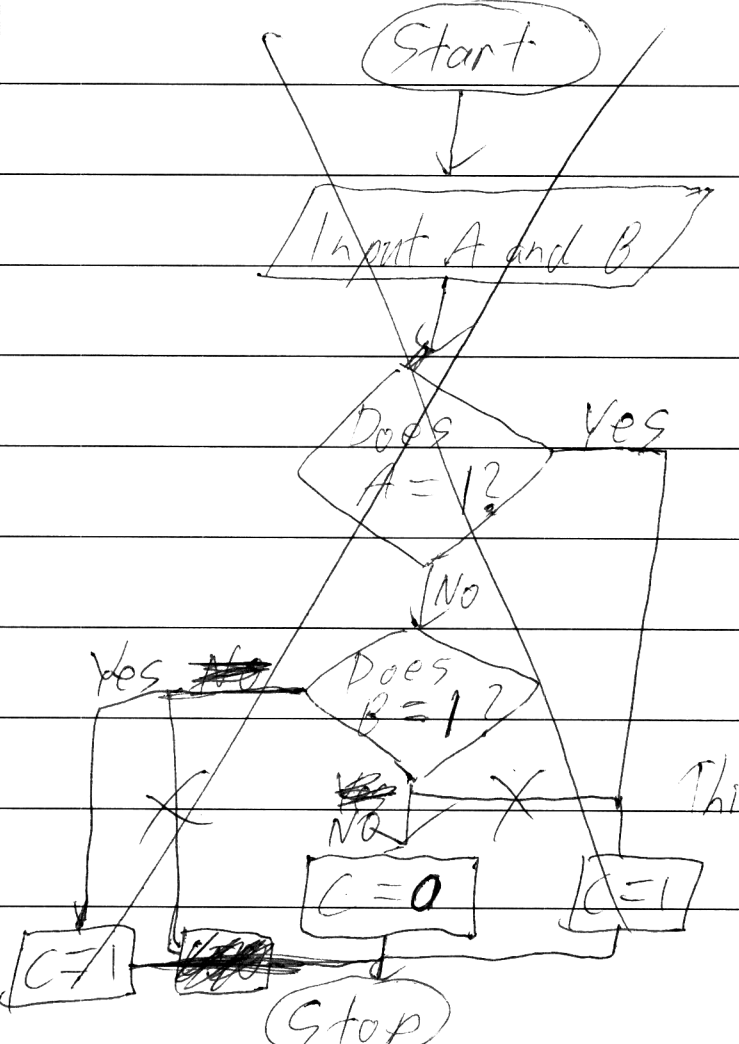
B.i. A flip-flop is a bistable memory circuit, that is, it can hold one of two values, it ~~can~~ ^{can be} used to store binary data



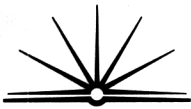
~~This diagram illustrates it can only hold one of two values~~

ii. Truth table for AND gate =

| A | B | C |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |



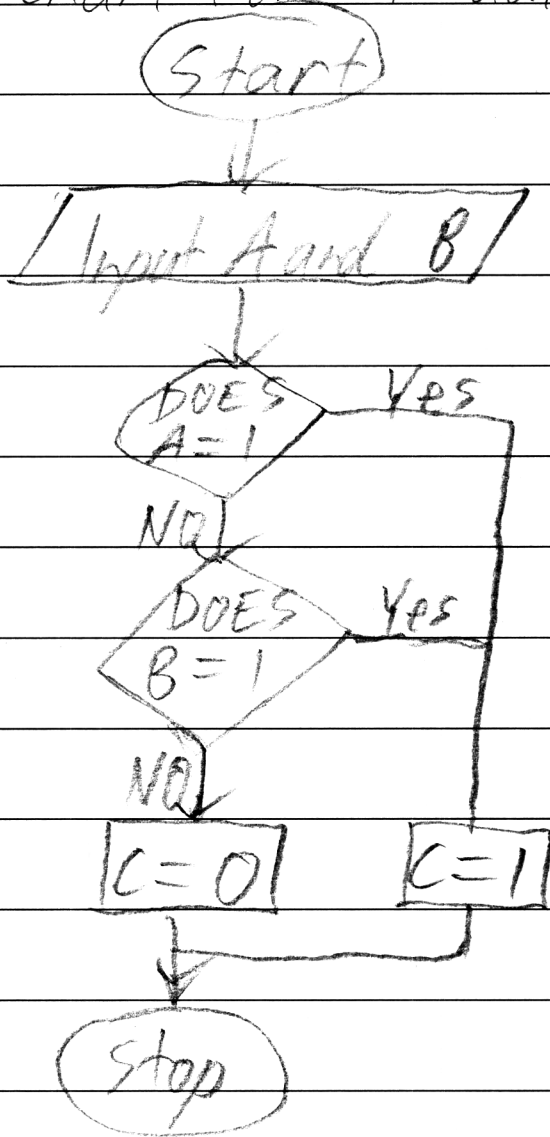
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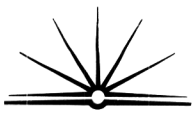
Flow chart for OR gate





C. The data stream that is sent from the door would have unique header information to identify it, as well as unique trailer information to show it is the end of the string or any other relevant information. The data characters would be a large stream as the picture would require a lot of bits to represent. The picture is in black and white so for example if 1 bit per pixel is used, the black part ~~could~~ could be a 1 and the white part (or valleys) could be a 0, ~~therefor there~~ ~~would~~ If this was the case there would be 1 bit for each pixel.

The primary difference between this data stream and the one sent ~~from~~ to the door is its size. Once the initial stream is processed and a result is decided, the result would be binary information, that is, a boolean



Question 25 (cont)

C. value representing ~~what~~ if the door should be opened or if it should remain shut. The header information as well as trailer information would once again be ~~a~~ unique values that would identify them, as well as any other relevant data. The data characters however would be of a very short length, in fact 1 bit would be suitable enough to store the ~~the~~ boolean value. When this data stream gets to the door, it will be recognised and it would know for example, that if the boolean value is 1 then the door will open, but if it is 0 then the door will remain closed.