10

CSE 360
ASSIGNMENT
(2)

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Section : 2

Answer to the ques No.-1

(a)

A keyboard is connected to port-A. So, Port-A is in mode-1 as keyboard is high level unidirectional device, input device.

Similarly, a monitor is connected to Port-B. So, port-B is in mode-1 as monitor is a high level output (unidirectional) device.

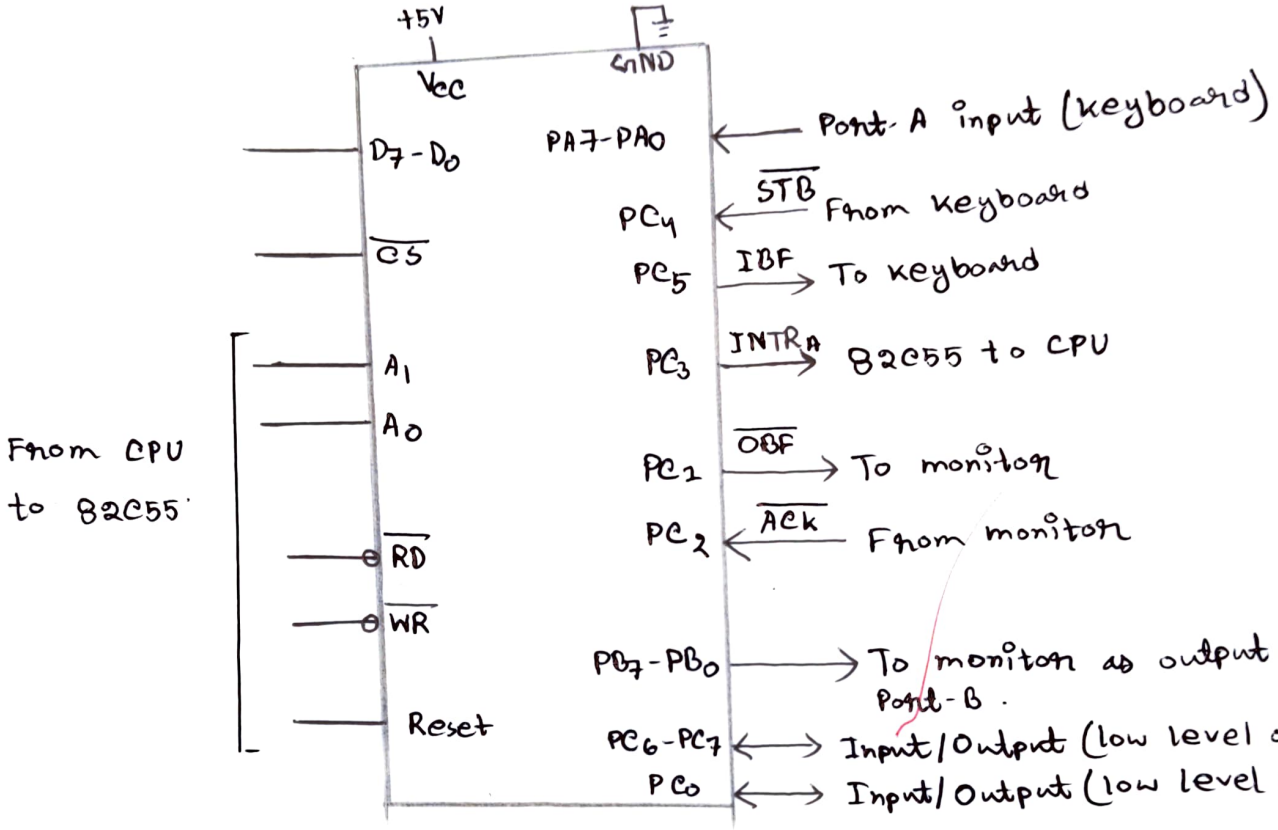
Now control bits to configure 82C55 IC are:

D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
1	0	1	1	1/0	1	0	1/0
I/O mode	Port-A in mode 1		Port-A input	PC_6, PC_7, 1 = input 0 = output PC_6, PC_7, are free. Can connect with low level devices.	Port-B in mode 1	Port-B Output	PC_0 is free. Can connect with low level devices input = 1 output = 0

This is the control bits to configure the 82C55 IC.

(b)

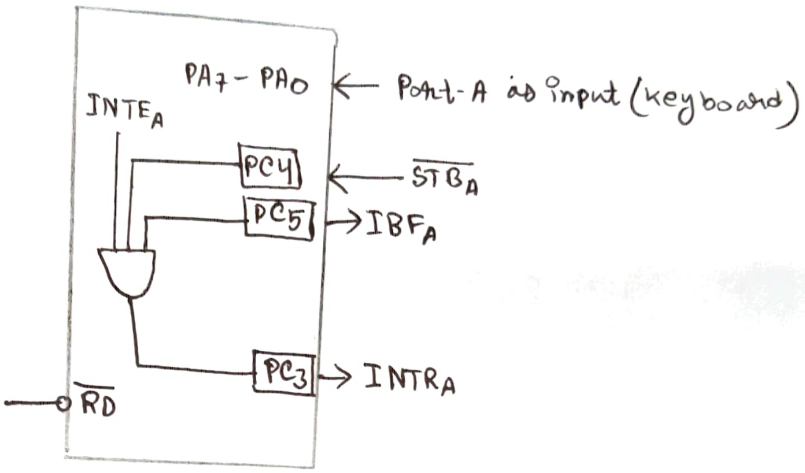
Diagram of configured 82C55 IC:



Here, we can see the block diagram of give Scenario.

(c)

Following ~~Following~~ Steps will be performed if we press 'B' key on the keyboard.



When we pressed 'B' on keyboard,

① 'B' key's ASCII value came as input to PA7-PA0.

② At the same, the $\overline{STB_A}$ will have '0' (active low). This means that, with this strobe signal, keyboard is letting the IC know that it's sending data. PC4 pin does the work.

③ The data sent from keyboard is now at the buffer, waiting to be processed by CPU.

④ As, the 8-bit data bus buffer gets full, it sends a signal to ~~PC5~~ keyboard. It's a acknowledgement signal. By this signal keyboard knows that the IC received the signal and the data bus buffer is full, also, we can not give any input now. The data stored in buffer has to be processed before getting any new data. IC gives the signal through PC5, it's a IBF_A signal. It states that 'input buffer full'. As it is active high, to be enable, '1' will be passed.

⑤ At the same time, when IBF signal is '1', $\overline{STB}$ must cause when the buffer is full, input device can not give any input so $\overline{STB}$ will '1' (active low)

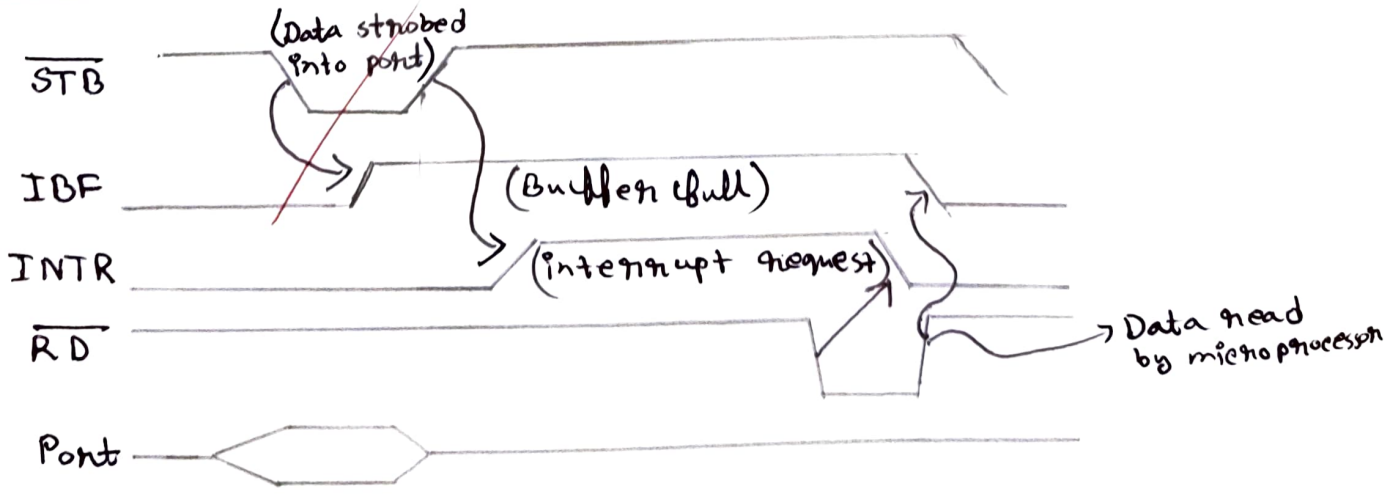
⑥ IC communicates with the micro-controller through PC_3 pin. An ~~Inte~~ interrupt signal is being sent to the micro-controller. This interrupt signal checks if the micro-controller is free to read the data. A high value '1' is sent to the micro-controller.

⑦ When, micro-controller is free, ~~he~~ it understands by looking at the interrupt signal that, a data is ready to be read. then sets $A_1 \Rightarrow 0$, $A_0 \Rightarrow 0$, it selects port A.

⑧ $\overline{RD} = 0$, enables read pin, $\overline{WR} = 1$, disables write pin.

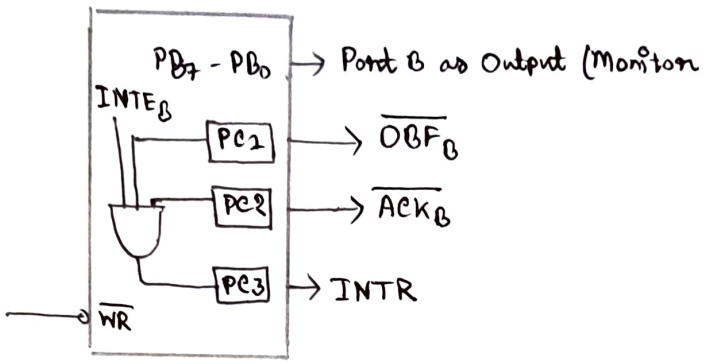
⑨ Once micro-controller reads the data. IBF signal is disabled. And the whole process starts again.

Timing diagram:



(d)

To see 'B' in the monitor, the steps are given below:



Here, PC_3 pin used to send interrupt signal to monitor, the same pin also used by port A. When we have opposite types (input and output) on port A and port B, then we can use 1 pin to send interrupt signal. It's ensures that there is no error. Only inputs or only output interrupt signals can pass.

① INTR signal will be high. INTR => 1. this signal is sent to check if any data is available to show.

② After acknowledging that an output device is connected to the IC, CPU enables $\overline{WR} \Rightarrow 0$ and $A_0 = 1, A_1 = 0$, selects port 'B'. Sends data from $D_0 - D_7$. Thus, enabling write pin allows the microprocessor to write to the output device which is connected to the port B.

③ The data sent by the cpu stores in the buffer. And at the same time INTR => 0. Cause data bus buffer is full and no new data is needed from cpu.

④ 82C55 sends 'output buffer full' signal to the monitor

$\overline{OBF_B} \Rightarrow 0$ to monitor

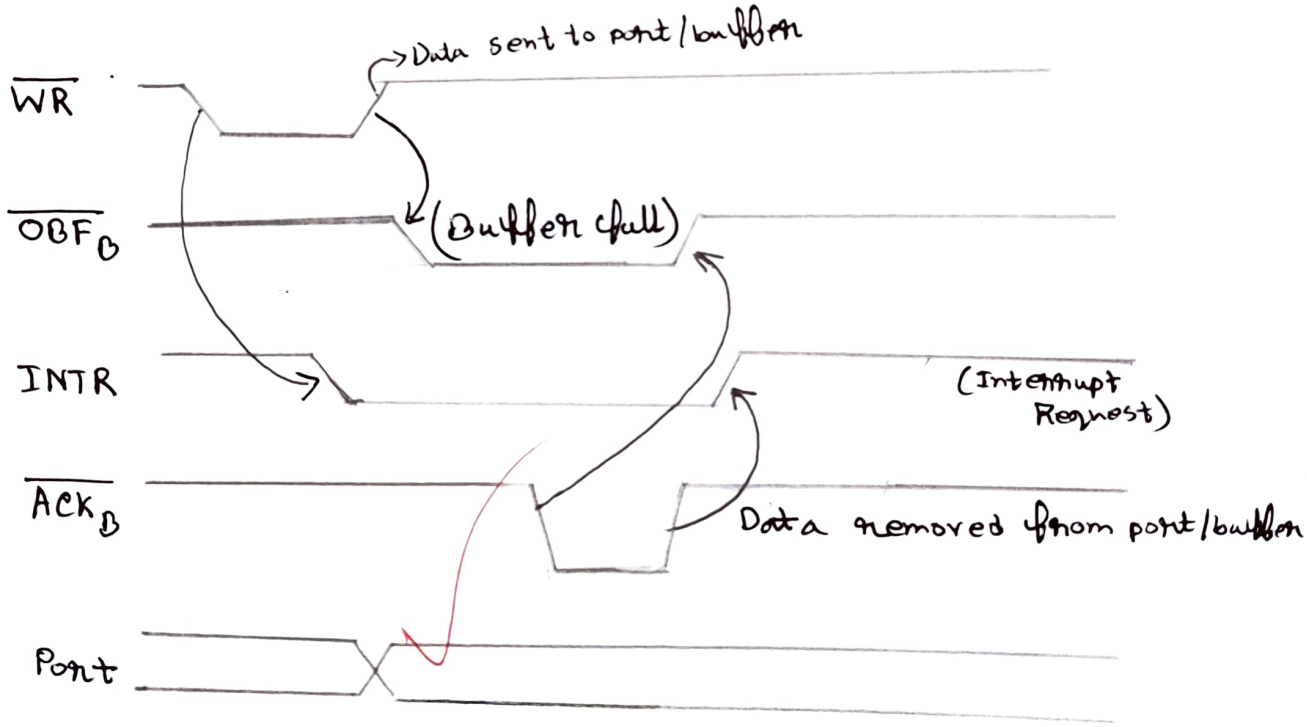
⑤ When the monitor is free, it sends an acknowledgement signal to the 82C55. $\overline{ACK_B} \Rightarrow 0$

⑥ Stored data from data bus buffer is now sent port B and to monitor. Then, $\overline{OBF_B} \Rightarrow 1$, as output buffer is empty after writing the data to the output device. Also, $\overline{ACK_B} \Rightarrow 1$.

INTR $\Rightarrow 1$.

Thus we can see 'B' on the monitor.

Timing diagram:



Ans. to the ques. No: 2

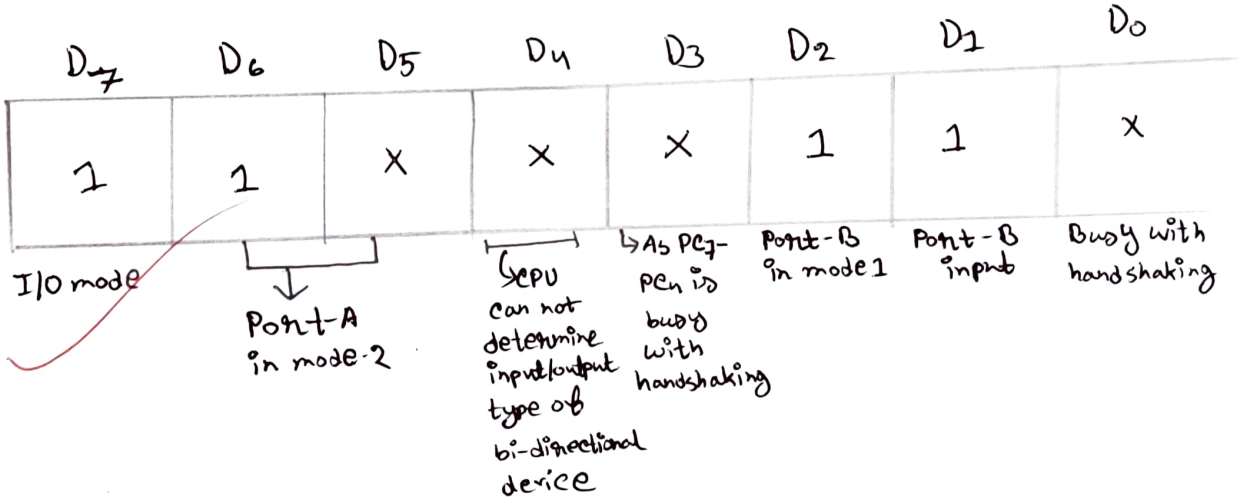
(a)

Given that,

An Ipad to port A of 82C55 PPI, So, port-A is operating in mode 2 as Ipad is a high level bi-directional device.

A mouse to port B. Port B is operating in mode 1. As mouse is a high level input device (unidirectional)

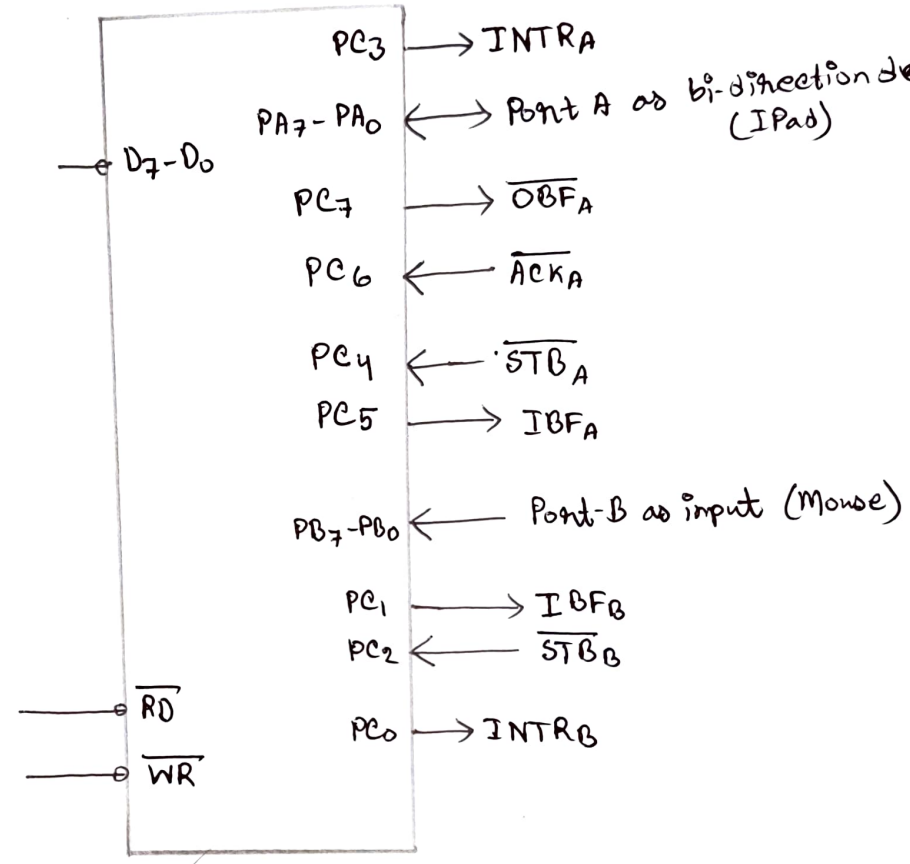
Now, control word by which 82C55 should be configured.



So, this is the control word in which 82C55 should be programmed.

(b)

Diagram of configured 8255 IC:



So, this is the diagram showing the configuration of 8255 IC.

Sequences and process that takes place between the 82C55 and Ipad is given below:

For initial configuration: $A_1 \Rightarrow 1$, $A_0 \Rightarrow 1$, $\overline{RD} \Rightarrow 1$, $\overline{WR} \Rightarrow 0$, Control bits $\Rightarrow$ 11X1X11X

(1) After tapping on screen to send data to microprocessor, 8 bit data will be passed through PA7 - PA0. At the same 8 time $\overline{STB_A} \Rightarrow 0$, enabling it means that data is being sent.

(2) When the buffer is full, it waits for the CPU to process the data. then, $IBF_A \Rightarrow 1$, indicating that buffer is full, all data has been received and can not send more data. At the same time $\overline{STB_A} \Rightarrow 1$, ~~disable~~ disabling the signal so that ipad can not give more data.

(3) Then, $INTR_A \Rightarrow 1$, indicating and asking the microprocessor if it can take any data.

(4) When CPU is free, it knows the device by looking at the interrupt signal, and gets ready to read data from the ipad. Sets $A_1 \Rightarrow 0$, $A_0 \Rightarrow 0$, $\overline{RD} \Rightarrow 0$, $\overline{WR} \Rightarrow 1$.

(5) Once the cpu reads the data, $IBF_A \Rightarrow 0$, disabling cause buffer is empty now. So

For a new data whole process repeats.

Now, the device will show output:

For initial configuration: $A_1 \Rightarrow 1$, $A_0 \Rightarrow 1$, $\overline{RD} \Rightarrow 1$, $\overline{WR} \Rightarrow 0$, control bits $\Rightarrow$ 1

(1) After processing the data, when the device is ready to show output, $INTR_A \Rightarrow 1$. Checking if the CPU is ready to deliver output. PC_3 pin is sending the signal.

(2) CPU, after acknowledgeing that ipad is connected and ready to show output. CPU starts to write data to the buffer. $\overline{WR} \Rightarrow 0$, $\overline{RD} \Rightarrow 1$. $A_1 \Rightarrow 0$, $A_0 \Rightarrow 0$, thus selects port A. At the same time $INTR_A \Rightarrow 0$, cause data bus buffer is full and no new data is needed.

(3) $\overline{OBF_A} \Rightarrow 0$, 'output buffer full' signal to the Ipad. So, that Ipad knows that buffer is full and it can start showing output.

(4) When Ipad is free, it sends an acknowledgement signal to the 82C55. $\overline{ACK_A} \Rightarrow 0$

(5) Stored data now being sent to the port A. And the output will be shown at the device. In the meantime, $\overline{OBF_A} \Rightarrow 1$, ~~disabling~~ ~~disable~~ disabling output buffer as it's empty. Also, $\overline{ACK_A} \Rightarrow 1$, $\overline{INTR_A} \Rightarrow 1$.

For a new output to show, the whole process will be repeated.

(d)

Timing Diagram: