

CSE360 Assignment-02

Answer to the Q.No 1

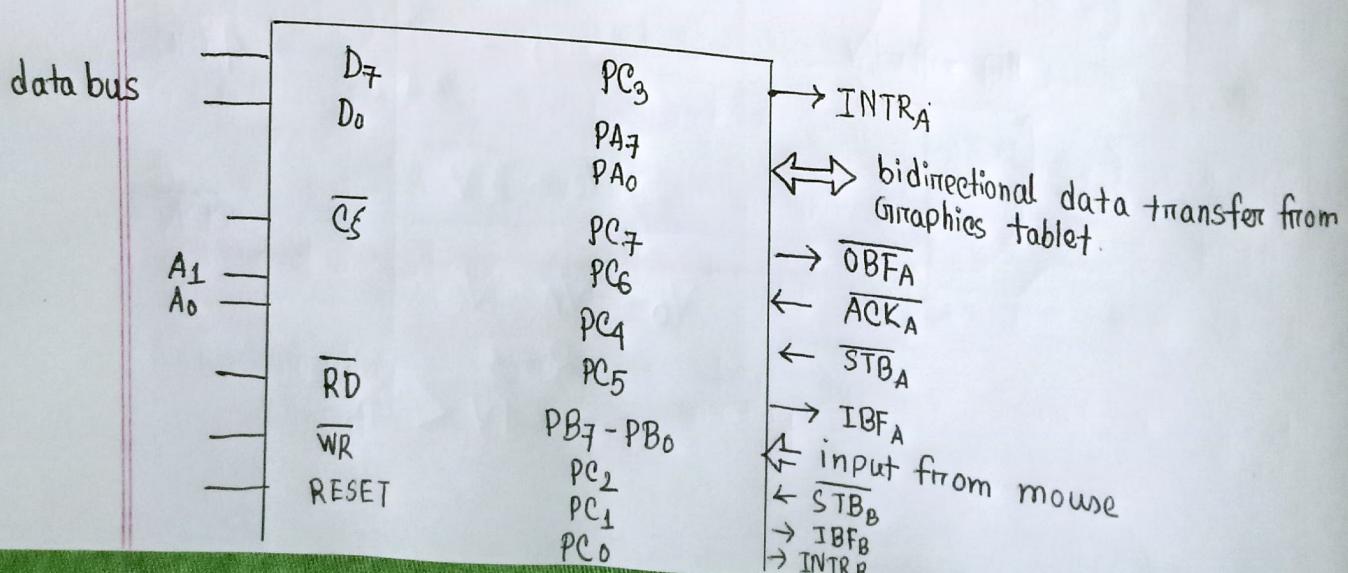
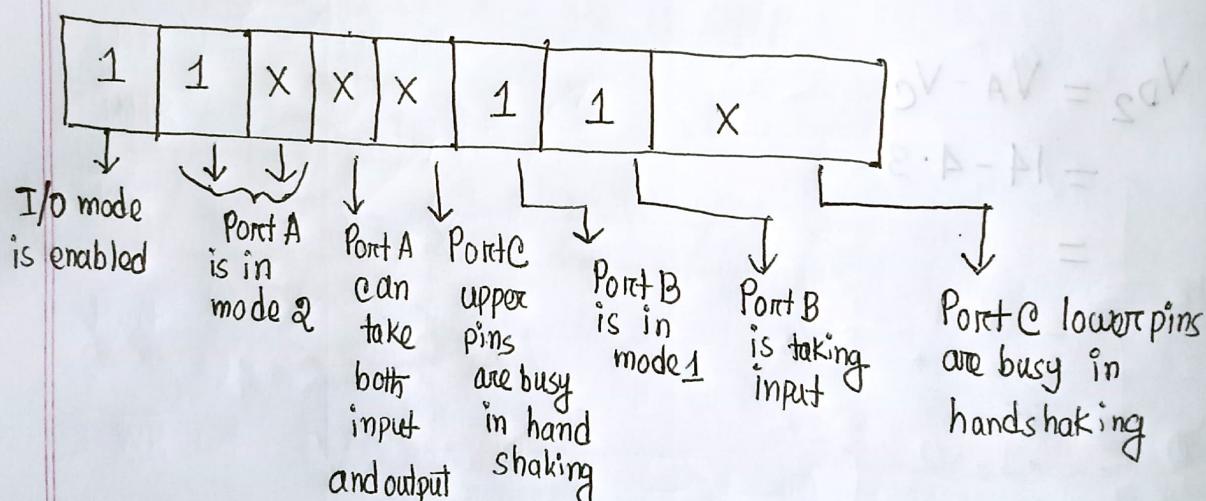
(a)

Port A is in mode 2 bidirectional I/O and Port B is in mode 1 input handshaking mode.  
Control bits:

1	1	X	X	X	1	1	X
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(b)

Configuration diagram:



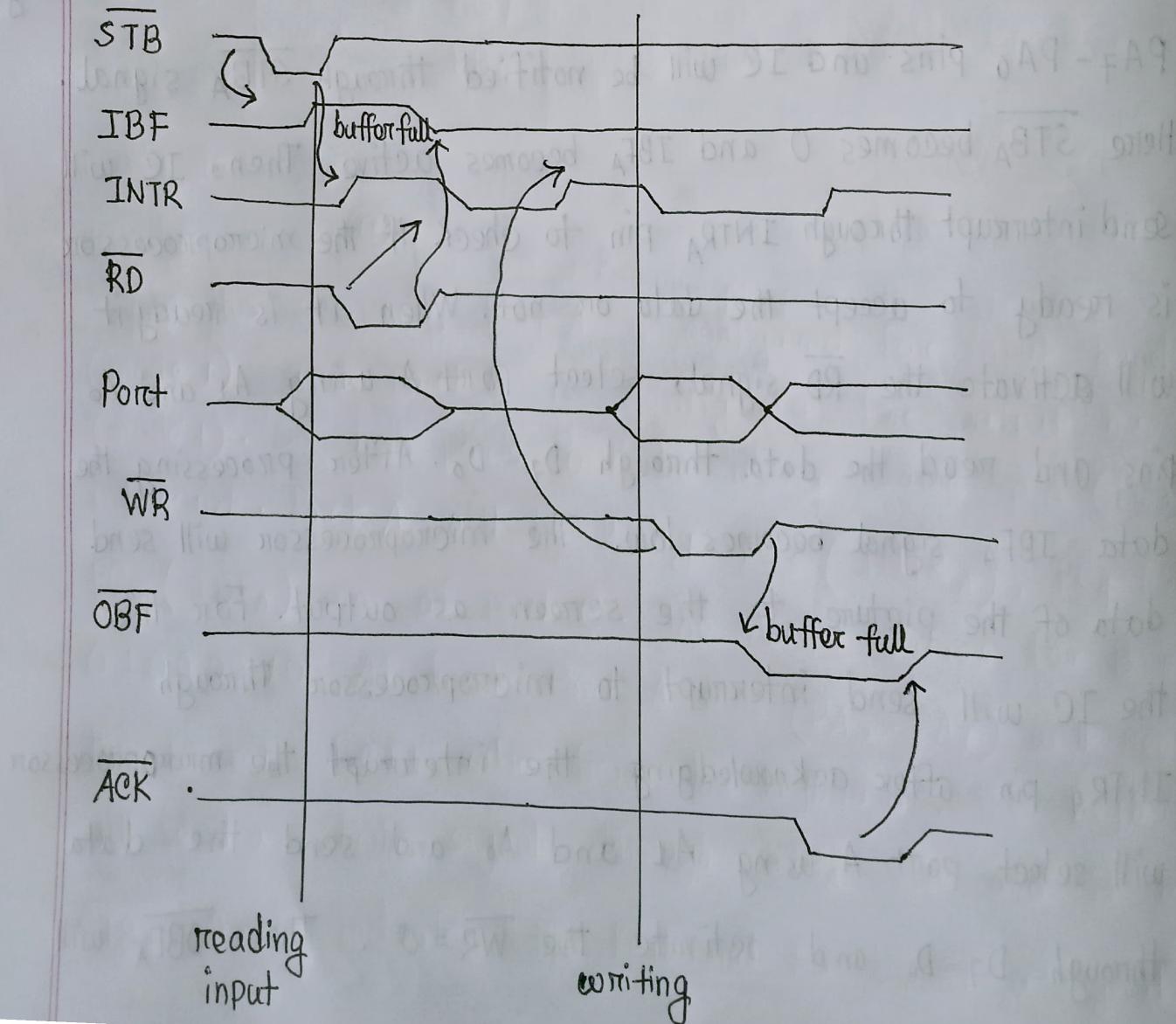
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In this process the touchscreen will take the input and provide the output on the screen, so it's a bidirectional process done using port A. So port A is in mode 2 and for this task the IC will use PC<sub>3</sub> (INTR<sub>A</sub>), PC<sub>4</sub> ( $\overline{STB}_A$ ), PC<sub>5</sub> (IBF<sub>A</sub>), PC<sub>6</sub> ( $\overline{ACK}_A$ ) and PC<sub>7</sub> ( $\overline{OBF}_A$ ) pins from Port C. In this process, at first the touch signal from Graphics tablet will be sent to the IC through PA<sub>7</sub> - PA<sub>0</sub> pins and IC will be notified through  $\overline{STB}_A$  signal. Here  $\overline{STB}_A$  becomes 0 and IBF<sub>A</sub> becomes active. Then, IC will send interrupt through INTR<sub>A</sub> pin to check if the microprocessor is ready to accept the data or not. When it is ready it will activate the RD signal, select port A using A<sub>1</sub> and A<sub>0</sub> pins and read the data through D<sub>7</sub> - D<sub>0</sub>. After processing the data IBF<sub>A</sub> signal becomes low. The microprocessor will send data of the picture to the screen as output. For this the IC will send interrupt to microprocessor through INTR<sub>A</sub> pin after acknowledging the interrupt the microprocessor will select port A using A<sub>1</sub> and A<sub>0</sub> and send the data through D<sub>7</sub> - D<sub>0</sub> and activate the  $\overline{WR} = 0$ . Then  $\overline{OBF}_A$  will

send signal to the screen and when screen is ready it will send acknowledgement through  $\overline{\text{ACK}_A}$  and output data of the picture is passed through PA<sub>7</sub>-PA<sub>0</sub> pins. Finally  $\overline{\text{OBF}_A}$  is disabled.

(b)

Timing diagram for bidirectional I/O in port A



Answer to the Q. No 2

(a)

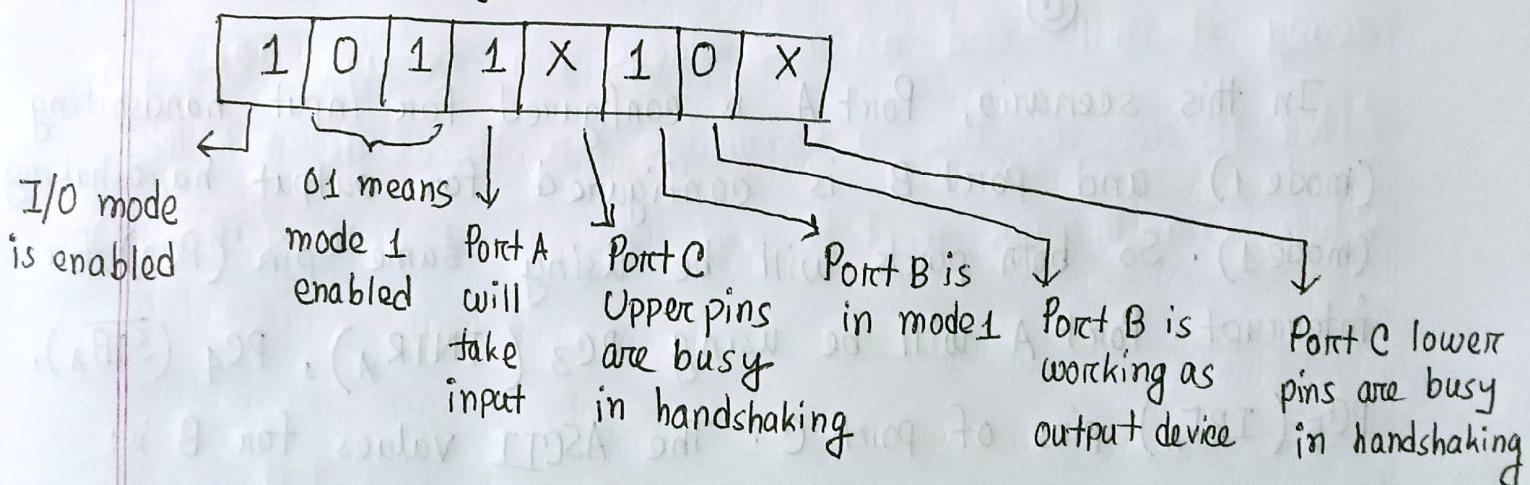
Port A in mode 1 input handshaking, Port B is in mode 1 output handshaking.

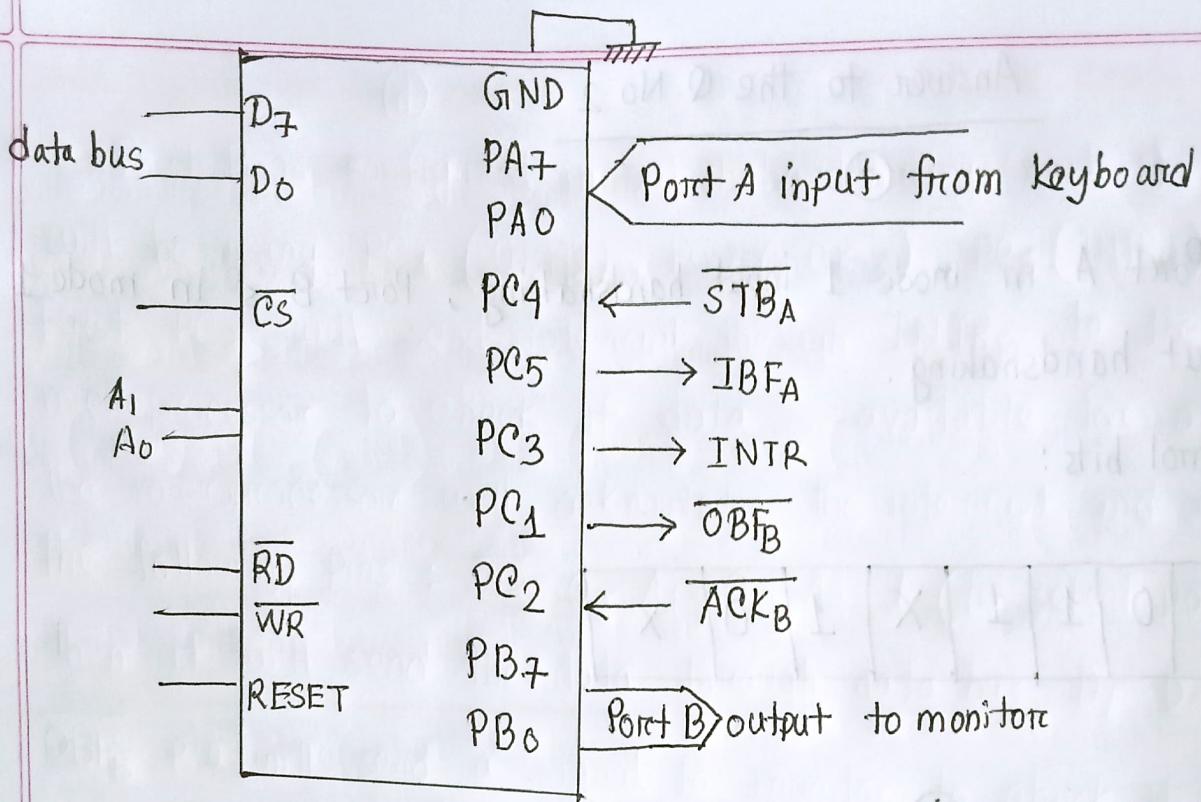
Control bits:

1	0	1	1	X	1	0	X
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(b)

Configuration diagram:



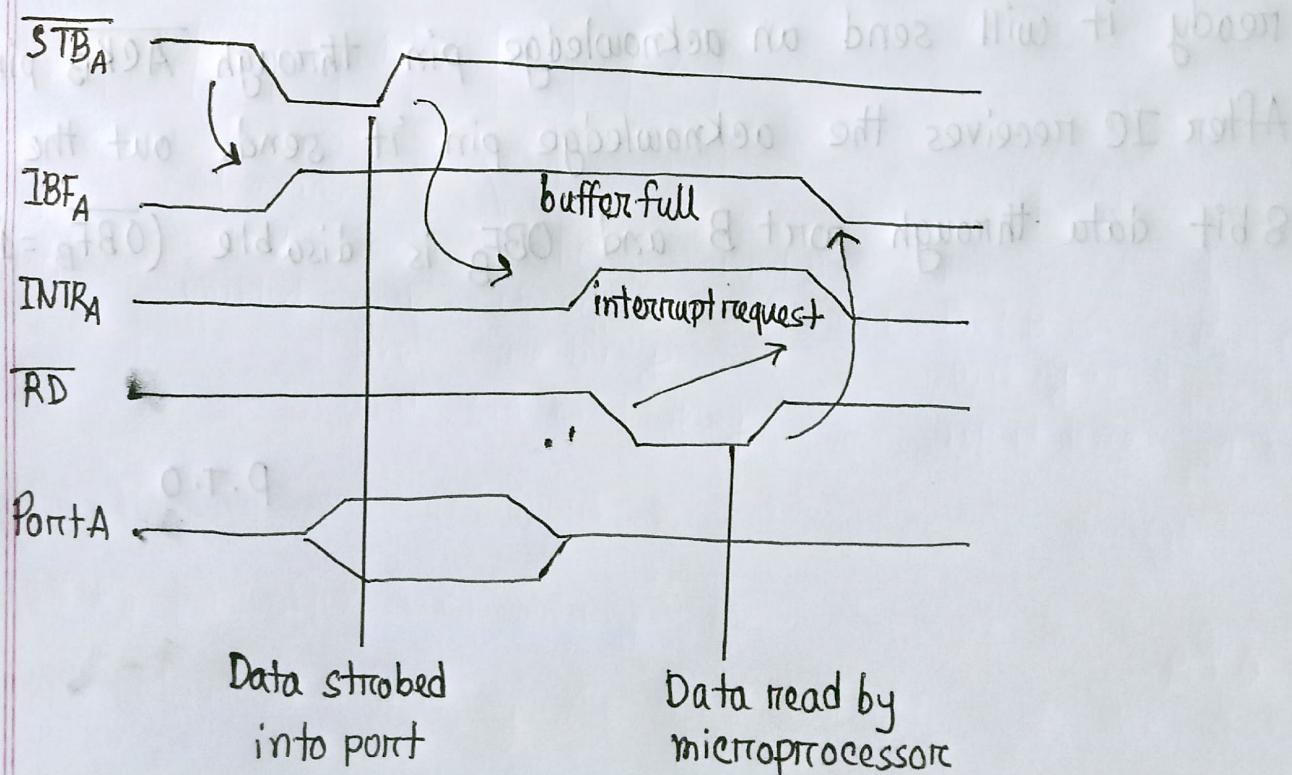


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In this scenario, Port A is configured for input handshaking (mode 1) and Port B is configured for output handshaking (mode 1). So both ports will be using same pin (PC3) for interrupt. Port A will be using PC3 ( $\text{INTR}_A$ ), PC4 ( $\overline{\text{STB}}_A$ ), PC5 ( $\text{IBF}_A$ ) pins of port C. The ASCII values for B is: 01000010. At first Port A pins ( $\text{PA}_0 - \text{PA}_7$ ) will receive the 8 bit ASCII value from the keyboard. The keyboard will send a strobe signal through  $\overline{\text{STB}}_A$  pin and it becomes  $\overline{\text{STB}}_A = 0$ . It indicates the Keyboard has sent a signal.

For receive strobe signal,  $\text{IBF}_A$  signal will be sent to the Keyboard as acknowledgement. Here  $\text{IBF}_A = 1$  and  $\overline{\text{STB}}_A = 1$ . Keyboard will know that data has been received by the IC. Now, IC will send interrupt signal through  $\text{INTR}_A$  pin and check if the microprocessor receives the data by setting up the following signals  $A_1 = 0$  and  $A_0 = 0$  to select port A and  $\overline{\text{RD}} = 0$  to read the data from Port A. Then microprocessor receives the data  $\text{IBF}_A$  becomes 0 now the Keyboard will acknowledge that data has been processed so it can send another data.

Timing diagram for input handshaking port A :



(d)

Port B is configured in output handshaking (mode 1). Port B will be using PC<sub>1</sub> ( $\overline{OBF}_B$ ), PC<sub>2</sub> ( $\overline{ACK}_B$ ), PC<sub>3</sub> (INTR<sub>B</sub>). First PC<sub>3</sub> will send interrupt through INTR<sub>B</sub> to the microprocessor to check if data is available for output. The microprocessor will acknowledge the interrupt and activate the following pins: WR=0, A<sub>1</sub>=0, A<sub>0</sub>=1 (to select port B). Then it will send the data through data bus D<sub>7</sub>-D<sub>0</sub>. The  $\overline{OBF}_B$  pin will send a signal to monitor to check if it's ready to show the output. Here  $\overline{OBF}_B = 0$ . When monitor is ready it will send an acknowledge pin through  $\overline{ACK}_B$  pin. After IC receives the acknowledge pin it sends out the 8 bit data through port B and  $OBF_B$  is disable ( $\overline{OBF}_B = 1$ )

P.T.O

Timing diagram for output handshaking in Port B:

