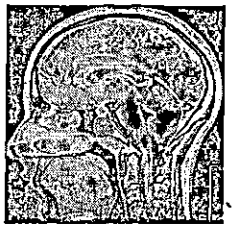
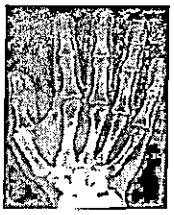
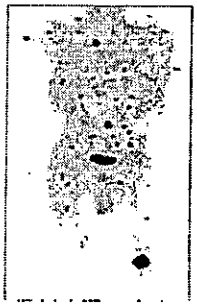
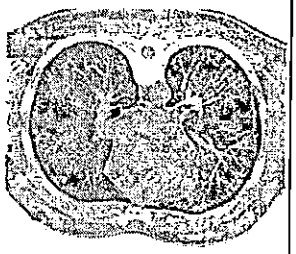
Mansoura University	Faculty of Engineering	Biomedical Engineering (BME) Department Time allowed: **1 Hour** Exam is three pages, **Full mark=30** Assume any missing data; **solve in same paper** **Include and name all steps**

الفصل:	الاسم:

Answer the following, showing details if possible

Question # 1: **[5 points]** Write the name, below the image, of the medical image modality (device) that is used to capture the following scans:

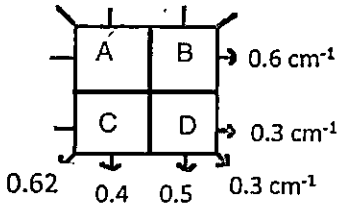
Image					
Device					

Question # 2: **[5 points]** With the aid of an illustrative figure, describe how nuclear imaging is performed. Define half value layer for a given isotope.

How nuclear image is performed: **[4 points]**

Half value layer: **[1 point]**

Question # 3: **[5 points]** If the vertical, horizontal, diagonal projections of a CT cross-section is shown below. Compute the pixel values (A, B, C and D) using the iterative reconstruction technique. Error should be < 0.02.



Question # 4: **[5 points]** For a CT image with two classes: Lungs (composed of 700 pixels) and background (rest of image). The joint probability for a pixel to have grey levels (q=0 or 1 or 2) and be a lung pixel is p(y=q,x=Lung)=[0.05 0.1 0.2], and p(y=q,x=background)=[0.45 0.15 0.05], respectively. Fill In below:

4.1 The prior probability for the pixel to be an object (lung) =.....

4.2 Size of the CT image=.....pixels

4.3 The probability that the grey level value for the image has the grey level value of one =.....

4.4 Based on Bayes classifier, pixels with grey level values of ..... will be classified as object (lung)

4.5 Baes classifier rule for classification is.....

4.1	4.2	4.3	4.4
4.5			

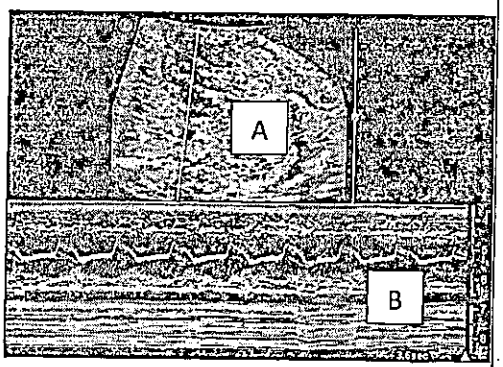
Question # 5: **[5 points]** A Pulse mode doppler (PMD) transducer emits two ultrasonic pulses with a frequency of 2 MHz through the body and receive back-echoes with frequencies of 2.2 MHz and 1.8 MHz, respectiveley. If the Ultrasonic speed is 1500 m/s. Determine the speed of the blood cells for each echo and whether they approaches or departs from the transducer. Mention one advantage of using PMD

Question #6: **[5points]** For the typical given ultrasonic scan below determine the following

5.1 The mode of image A is .....and of B is .....

5.2 Each vertical line in A represents .....

5.3 The vertically alternating line in B represents .....



If the following Matlab code is to process this image. Answer below:

```
clear
Image=imread('B.bmp'); % read the ultrasonic image B
[r,c]=size(Image)
[x,y]=find(Image>254)
```

The output on the command window was as follows:

```
>> r=128
>> c=256
>> x=[200]
>> y=[50]
```

5.4 The size of the image is ..... pixels

5.5 The number of pure white pixels (of grey level values of 255) in the image variable is .....

5.1	5.2	5.3
5.4	5.5	

تمت الاسئلة خالص امنياتى بالتوفيق د. أحمد النقيب