UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2011/2012

COURSE NAME	:	MEDICAL IMAGING
COURSE CODE	:	DEU 2213
PROGRAMME	:	2 DET
EXAMINATION DATE	:	MARCH 2012
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE(5)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **SIX(6)** PAGES

Q1 Multimodality imaging systems produce images that reveal different characteristics of the structure and function of the human body. Each imaging technology produces potentially complementary information about the body for the diagnosis and treatment of disease. The characteristics of the imaging equipment are quite different, depending on the basic mechanisms used for image formation and the details of implementation, but the general imaging process is similar for all technologies.

(a) Briefly explain the steps in biomedical image formation.

(5 marks)

(b) Some common characteristics of imaging systems that form a basis for comparison between them are inherent spatial resolution, contrast resolution, and temporal resolution. Most imaging systems can also be characterized as those that produce images of structure and those that produce images of function, although several modalities can be used for both. Briefly explain the following image characteristic :

(i) Spatial Resolution
(ii) Contrast Resolution
(iii) Temporal Resolution

(15 marks)

Q2 (a) Figure Q2(a) is an electrode pair for X-Ray machine.

(i) Identify the components of the electrode pair labeled A to I.
(ii) Explain how the X-ray beam is being generated by the electrode pair.

(15 marks)

(b) In a normal X-ray picture, most soft tissue doesn't show up clearly. To focus in on organs, or to examine the blood vessels that make up the circulatory system, doctors must introduce contrast media into the body. Explain about contrast media.

(5 marks)

Q3 Nuclear medicine imaging systems image the distribution of radioisotopes distributed within the body, preferably to a specific organ or structure of interest. Several different radioisotopes are used, with the particular element or tag selected based on the physiologic function to be measured. The images acquired from these systems provide a direct representation of metabolism or function in the organ or structure being imaged. There are two main types of nuclear medicine scanning technologies: single photon emission computed tomography (SPECT) and positron emission tomography (PET). Discuss the following two main types of nuclear medicine scanning technologies for its operation and capability.

(a) Single Photon Emission CT (SPECT)

(10 marks)

(b) Positron Emission Tomography (PET)

(10 marks)

Q4 Figure Q4(a) shows the parts of a basic ultrasound machine.

(a) Identify the usage of each part of the basic ultrasound machine

(14 marks)

(b) Explain the purpose of having many shapes and sizes of the transducer probes

(6 marks)

Q5 (a) The ability to window is a valuable feature of all digital images. Illustrate and describe the process of windowing.

(14 marks)

(b) In windowing technique, identify the combination of two parameters that determine the range of pixel values that will be displayed with contrast in an image.

(2 marks)

(c) Describe a possible clinical advantage of changing window level (center) when viewing an image.

(4 marks)

Q6 (a) Briefly explain the purpose of DICOM files.

(5 marks)

(b) Identify the Matlab function for the following process :

(i) Read a DICOM image
(ii) Write images as DICOM files
(iii) Read metadata from a DICOM message

(6 marks)

(c) Give an example of Matlab function usage for the following process :

(i) Read a DICOM image
(ii) Write images as DICOM files
(iii) Read metadata from a DICOM message

(9 marks)

Q7 (a) Explain why the ability to perform digital processing of radiographic images is a significant advantage.

(3 marks)

(b) Identify three possible quality characteristics of medical images that can be changed by digital processing.

(3 marks)

(c) Describe the general process of changing image contrast by using Look Up Tables (LUT).

(14 marks)

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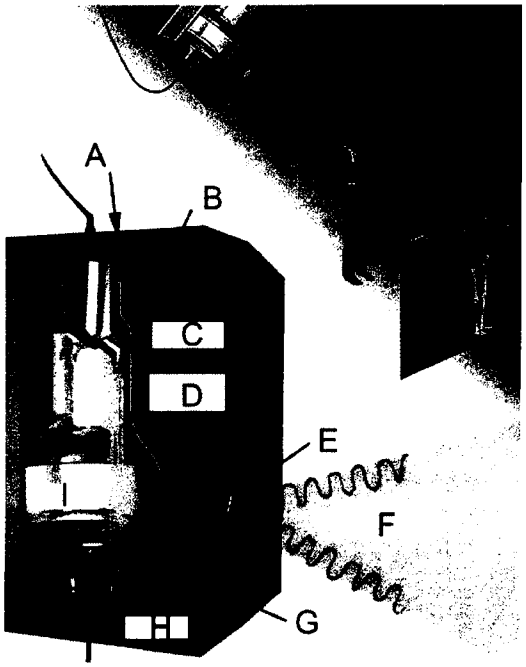

FIGURE Q2(a)

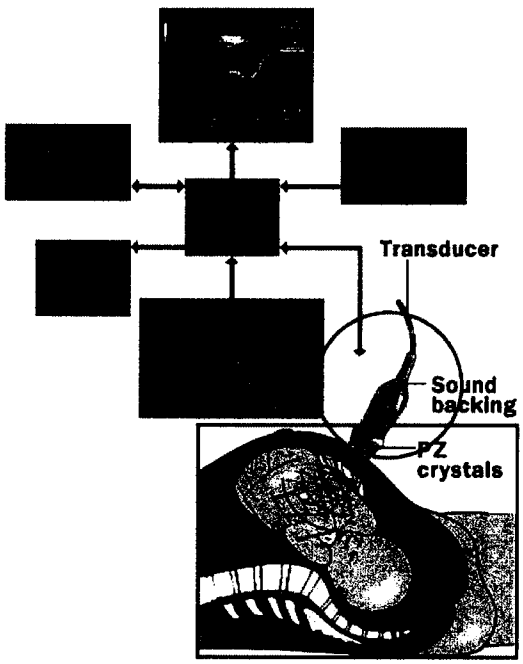

FIGURE Q4(a)