



Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech (BME)/SEM-6/BME-603/2010

2010

BIOMEDICAL IMAGING — II

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$
 - i) Human eye is capable of distinguishing of about
 - a) 10 gray scale level
 - b) 25 gray scale level
 - c) 35 gray scale level
 - d) 50 gray scale level.
 - ii) Dewar chamber of superconductive electromagnet in MRI is consist of
 - a) Liquid nitrogen
 - b) Liquid helium
 - c) Liquid oxygen
 - d) Liquid carbon dioxide.
 - iii) The piezoelectric crystal used in commercially manufactured ultrasound units is
 - a) Caesium Iodide (CsI)
 - b) Natural quartz
 - c) Sodium Iodide (NaI)
 - d) Lead Zirconate titanate.



- iv) Voxel is
- a) 1D image
 - b) 2D image
 - c) 3D image
 - d) None of these.
- v) In the Hounsfield scale the CT number assigned to water is
- a) Zero
 - b) - 1000
 - c) + 1000
 - d) + 400.
- vi) The frequency of ultrasound scanner ranging from
- a) 1 - 10 MHz
 - b) 2.5 - 40 MHz
 - c) 40 - 80 MHz
 - d) 10 - 100 MHz.
- vii) Which of the following equipment is a radioisotope generator ?
- a) PET
 - b) SPECT
 - c) Cyclotron
 - d) Technetium - 99.
- viii) Time gain compensation is an important parameter of
- a) CT - scan
 - b) Ultrasound imaging
 - c) MRI
 - d) PET scan.
- ix) In a CT scanner we measure
- a) Amount of radiation absorbed by object
 - b) Amount scattered radiation
 - c) Linear attenuation coefficient between tube and detector
 - d) Diffracted radiation.



x) Echo-ophthalmoscopic diagnosis is done by

- a) A-mode ultrasound b) B-mode ultrasound
c) M-mode ultrasound d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. What is an Isotope ? Explain with a block diagram a Radioisotope Generator commonly used in the Nuclear Medicine department of a hospital. 1 + 4
3. Write an equation for linear attenuation coefficient of an object 'x' and the corresponding Hounsfield (HU). Draw Hounsfield scale. 2 + 3
4. What is real-time imaging ? Describe various scanning system used in real-time imaging. 2 + 3
5. What are different modes of ultrasound imaging ? Briefly explain. 5
6. What is functional MRI ? Mention the probable uses of MRI in medical field. 2 + 3
7. What is piezoelectric crystal ? Draw an equivalent circuit of piezoelectric crystal and explain it. 2 + 3



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. What are the special features required of a CT tube ? What are the special features required in CT detectors ? Draw a sketch of Scintillarc and explain the features. $5 + 4 + 6$
9. Briefly explain the basic principles of magnetic resonance imaging. Mention the main system of MRI instrumentation and draw a block for the electronic component of MRI system. $9 + 6$
10. Describe T1 and T2 relaxation of magnetic resonance imaging. Explain the gradient system and its importance in tomographic imaging. $8 + 7$
11. Briefly explain the different techniques used for radionuclide production. Describe the working principles of gamma camera. $6 + 9$
12. Write short notes on any *two* of the following : $2 \times 7\frac{1}{2}$
 - a) Windowing system in CT-scan.
 - b) Artefacts and their causes in CT imaging.
 - c) PET.
 - d) PACS.

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