Seat No.

Ganpat University

B. Tech. Semester: 7th(Biomedical & Instrumentation) Engineering

CBCS Regular Examination November 2014

2BM701–ADVANCED MEDICAL IMAGING TECHNIQUES

TIME -: 3 Hours **TOTAL MARKS -: 70**

Instructions:

1. All the questions are compulsory.
2. Answer of each section must be written in separate answer books.
3. Figure to the right indicate marks.
4. Assume data, if needed.
5. Conventional terms / notations are used.

Section – I

Que.-1 **[12]**

a). Give the advantage of CT over conventional X-ray. Explain CT principle with diagram.

b). Explain all the detectors used in CT scanner with advantages and disadvantages.

OR

Que.1 **[12]**

a). Discuss various factors responsible for image quality in CT scanner.

b). For 2D parallel beam geometry of CT obtained projection function PΘ (r) equation.

Que.2 **[11]**

a). Write short note on PET

b). Enlist various Nuclear radiation detectors. Draw Schematic diagram of any one detector and explain.

OR

Que.2 **[11]**

a). What are the Essential Properties of Radionuclide? Explain in brief.

b). Discuss any two biomedical application of radionuclear imaging.

Que.3 **Answer any three.** **[12]**

a). What is the difference between Radiology, Radio-diagnosis & Imagiology? What are the various methods in Radiology?

b). Explain the data acquisition system of a CT scanner giving neat diagram

c). How the different generation of CT differ from each other.

d). Describe the principle of SPECT.

Section – II

Que.-4 [12]

a). What is the limitation of classical mechanics? Explain quantum mechanics theory?

b). What is spin-lattice and spin-spin relaxation time? Why their values for fluids are long? Calculate signal intensity ratio for H_2O and fat having the pulse sequence parameters as TR = 2500ms and TE = 100ms. Given values: B_0 = 1T. For H_2O: T1and T2 both are equal to 2500ms & fat: T1=200ms and T2=100ms. Assume similar spin density for these tissues

OR

Que.4 [12]

a). How slice is selected in MRI? Write formula for calculating slice thickness and mention the limitations encountered for selecting thin slices? If main magnetic field strength and slice selective gradient strength is 1 T and 40mT/m respectively, calculate the RF transmitter pulse frequency for selecting slice 30 cm away from body center

b). Describe frequency encoding gradient for Image reconstruction

Que.5 [11]

a). Discuss inversion recovery pulse sequence with STIR imaging. What is TI time.

b). Enlist types of magnets that can be used in MRI system and explain any one in detail. Why shielding of magnets and shimming is done?

OR

Que.5 [11]

a). Discuss spin echo pulse sequence with the Dephasing phenomenon. Draw corresponding schematic diagram and K-space trajectory.

b). Write about the photon detectors and imaging system used in Infrared imaging.

Que.6 [12]

Answer Any Three.

a). Biological effects and safety aspects of MRI

b). Three dimensional imaging of MRI with figure of GE sequence

c). Transmitter and receiver coils used in MRI system

d). Pyroelectric imaging system and clinical thermography applications

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