Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –IIst SEMESTER–EXAMINATION – JULY- 2012

Subject code: 1723102 **Date: 09/07/2012**

Subject Name: Advanced Biomedical Imaging

Time: 10:30 am – 13:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Explain working of on site The Technetium generator and also derive equation for the radioactivity.	**07**
	(b)	Explain basic Instrumentation of The Gamma Camera.	**07**
Q.2	**(a)**	Explain The Anger Position Network used for estimating the location at which a particular r-ray strikes the scintillation crystal.	**07**
	(b)	Explain working principle of the annihilation coincidence detection circuit used in PET.	**07**
		OR	
	(b)	Explain all corrections that apply for Image reconstructions in PET.	**07**
Q.3	**(a)**	**(1)** Intensifying screens can be placed on both sides of the X-ray film or on one side only. Explain why double sided screens give higher image SNR, but single sided screens have a better spatial resolution.	**03**
		(2) Explain the construction of active matrix flat panel X-ray detectors.	**04**
	(b)	Explain schematic of multi slice Spiral computed tomography including basic principle of data reconstruction.	**07**
		OR	
Q.3	**(a)**	**(1)** Explain schematic of an instrumental setup used for dual energy x-Ray imaging.	**04**
		(2) Explain detectors that used for computed tomography.	**04**
	(b)	What should be the modification required in Back projection method for Fan- beam reconstruction used in CT?	**06**
Q.4	**(a)**	Give the basic idea about Ultrasonic Diagnostic scanning modes.	**07**
	(b)	Explain schematic of thermal Imaging techniques with its clinical applications.	**07**
		OR	
Q.4	**(a)**	Explain ultrasonic beam energy loss mechanisms in tissues.	**07**
	(b)	Suppose that at 1 Tesla , the approximate T1 and T2 values of H2O and Fat are follows: For H2O T1=2500ms, T2=2500ms For Fat T1=200ms, T2=100ms. Calculate signal intensity ratio for H2O and Fat for the pulse sequence TR=500ms, TE= 25ms and Draw it graphically. Assume spin densities for these tissues are 100.	**07**
Q.5	**(a)**	Explain Inversion recovery Pulse sequence with its clinical applications.	**07**
	(b)	Explain slice select gradient for MRI. How to change the slice thickness?	**07**
		OR	
Q.5	**(a)**	Explain frequency encoding method used for Image construction in MRI.	**07**
	(b)	Explain working principle of Magnetic Resonance Spectroscopy with its clinical applications.	**07**

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