Reg. No. : | | | | | | | | | | | | |

Question Paper Code: U6B02

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Sixth Semester

Biomedical Engineering

21UBM602 - MEDICAL IMAGING EQUIPMENT

(Regulations 2021)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1.	What is the need of cooling system in X-ray tube?	CO1-U
2.	Compare radiography and fluoroscopy.	CO1-U
3.	Mention the significance of CT number.	CO1-U
4.	What are the characteristics needed for the CT detectors?	CO1-U
5.	Define the concept of precession used in MRI.	CO1-U
6.	Illustrate the importance of Larmor frequency.	CO1-U
7.	List the characteristics of beta radiation.	CO1-U
8.	List out the uses of position logic circuit in nuclear imaging.	CO1-U
9.	What is a Dosimeter, and how does it measure radiation exposure?	CO1-U
10.	Mention the radiation protection methods used in Medicine.	CO1-U

PART – B (5 x 16= 80 Marks)

11.	(a)	(i) Draw the block diagram of X-ray machine and explain the need of each block.	CO1-U	(10)
		(ii) Discuss the principle of Digital subtraction Angiography.	CO1-U	(6)
		Or		
	(b)	(i) Explain the principle and working of digital fluoroscopy with a neat diagram.	CO1-U	(10)
		(ii) Show how fluoroscopy is differ from Radiography.	CO1-U	(6)

12.	(a)	(i) Discuss in brief the generations of CT and its advantages and disadvantages of each generation.	CO1-U	(8)
		(ii) What modifications can be made to the detector system of a CT scanner to improve the acquisition speed and enable faster volume scanning, and what tradeoffs need to be considered in terms of image quality, patient dose and hardware complexity?	CO2-App	(8)
		Or		
	(b)	(i) Explain the CT image reconstruction using back projection algorithm.	CO1-U	(8)
		(ii) Choose the technology used in spiral and helical CT scans be applied to optimize the imaging parameters and improve the image quality of CT scans for accurate diagnosis of medical conditions.	CO2-App	(8)
13.	(a)	(i) Discuss the function of different gradient coils Gx, Gy and Gz used in MRI.	CO1-U	(12)
		(ii) Compare the advantages and disadvantages of CT scan and MRI modalities.	CO1-U	(4)
		Or		
	(b)	(i) Describe the basic principles of MRI. Explain in brief the main components of MRI equipment.	CO1-U	(12)
		(ii) Outline of techniques in functional MRI.	CO1-U	(4)
14.	(a)	Identify the potential impact of positron-emitting isotopes on the field of medical imaging and diagnosis, including their ability to provide high-resolution images and accurate measurements of metabolic activity. How might this impact in medical research and treatment, and what ethical considerations should be taken into account when using these technologies?	CO4-Ana	(16)
		Or		
	(b)	Compare and contrast the principles of SPECT and PET imaging, including their underlying mechanisms, advantages, and disadvantages. Provide examples of how these imaging modalities are utilized in clinical and research settings, and discuss the potential limitations and challenges that may arise from their use.	CO4-Ana	(16)

15.	(a)	(i)	Define principles of radiation protection. Describe various parameters which can reduce patient radiation dose in radiography and fluoroscopy.	CO1-U	(8)
		(ii)	Analyze the effectiveness of IGRT compared to other radiation therapy techniques in terms of improving treatment accuracy and reducing side effects for cancer patients.	CO4-Ana	(8)
			Or		
	(b)	(i)	Summarize the limitations of various radiation measuring instruments in detecting different types of radiation.	CO1-U	(8)
		(ii)	In comparison to other radiation monitoring tools, analyze how accurate is a dosimeter in measuring radiation exposure.	CO4-Ana	(8)