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Question Paper Code: U6B02

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

Sixth Semester

Biomedical Engineering

21UBM602 - MEDICAL IMAGING EQUIPMENT

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 2 = 20 Marks)

1. List the factors affecting X-ray absorption. CO1-U
2. Differentiate between digital radiography and conventional radiography. CO1-U
3. Identify why conventional radiograph is not a tomogram. CO1-U
4. List out the characteristics needed for the CT detectors? CO1-U
5. Define the phenomenon of free induction decay. CO1-U
6. Why superconducting magnet is used in MRI? CO1-U
7. List the characteristics of Alpha radiation. CO1-U
8. What are the characteristics needed for the radionuclide to be used for imaging? CO1-U
9. Give the applications of Thermo Luminescent dosimeters. CO1-U
10. List out the radiation protection methods used in Medicine. CO1-U

PART – B (5 x 16= 80 Marks)

11. (a) (i) Analyze the several ways that high voltage may be generated for X-ray equipment. With the use of a graphic, explain what the benefits of using high frequency for the development of high voltage. CO4-Ana (10)
- (ii) Compare radiography and fluoroscopy with the clinical needs. CO4-Ana (6)

Or

- (b) (i) Analyze why an X-ray machine needs both a grid and collimators, and show where they are used with necessary illustrations. CO4-Ana (10)
- (ii) Inspect the causes of X-ray tube failures. CO4-Ana (6)
12. (a) (i) Discuss the generations of CT and its advantages and disadvantages of each generation. CO1-U (8)
- (ii) Select the appropriate contrast media to inject to the human body which will be optimized in CT scans for improving the visualization and detection of abnormalities in various organs and tissues inside the body. CO2-App (8)
- Or
- (b) (i) What are the different types of image reconstruction methods? Explain the principle of image reconstruction using Iterative method. CO1-U (8)
- (ii) Select the appropriate detector type based on the specific imaging needs and clinical goals of the study. CO2-App (8)
13. (a) (i) Explain the principle of Nuclear Magnetic Resonance Imaging. CO1-U (12)
- (ii) Explain the gradient coils used in MRI with neat diagram. CO1-U (4)
- Or
- (b) (i) Explain the Relaxation processes T1 & T2 and give its significance in the Image formation. CO1-U (12)
- (ii) Illustrate the concept of rotating frames in NMR. CO1-U (4)
14. (a) Analyze the principles behind the various radiation detectors used in nuclear imaging. How do these detectors differ in terms of their characteristics, and what are the implications for their use in different imaging applications? CO4-Ana (16)
- Or
- (b) How optical coherence tomography (OCT) is used in the diagnosis and treatment of eye illnesses such as glaucoma and macular degeneration. In what ways does OCT make it feasible to detect and monitor these disorders at an earlier stage? CO4-Ana (16)
15. (a) (i) Explain the different types of radiation protection devices. CO1-U (10)
- (ii) How effective is Cyber knife in treating tumors compared to other radiation therapy techniques? CO4-Ana (6)

Or

- (b) (i) Explain the different types of radiation measuring Instruments. CO1-U (10)
- (ii) To what extent does IMRT discriminate compared to other radiation therapy techniques in treating various types of cancer? CO4-Ana (6)

