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Question Paper Code: 56B01

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Sixth Semester

Biomedical Engineering

15UBM601- MEDICAL IMAGING EQUIPMENTS

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- The X-ray generation efficiency is very low and is given by $\eta =$ CO1- R
 - $\frac{\text{Electron beam energy}}{\text{Anode voltage}}$
 - $\frac{\text{Electron beam energy}}{\text{X-ray beam energy}}$
 - $\frac{\text{X-ray beam energy}}{\text{Atomic energy}}$
 - $\frac{\text{X-ray beam energy}}{\text{Electron beam energy}}$
- Mammography is used to examine the: CO1- U
 - Heart
 - Breast
 - Kidney
 - Lung
- The detailed X-ray images of the slices of the body is obtained by means of CO2- R
 - Computerized axial tomography
 - fluoroscopy
 - MRI
 - Scintillation detector arrays
- North – East diagonal of the matrix $\begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix}$ is: CO2- U
 - $\begin{bmatrix} 12 & 6 \\ 9 & 15 \end{bmatrix}$
 - $\begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix}$
 - $\begin{bmatrix} 7 & 6 \\ 8 & 10 \end{bmatrix}$
 - $\begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$

5. The excited nuclear spins will slowly return to its equilibrium emitting a radiofrequency signal called _____ . CO3- U
- (a) Chemical shift (b) Nuclear magnetic Resonance (NMR)
- (c) Fourier Transform NMR (d) In-vivo NMR
6. The use of superconducting magnets in MRI is to obtain CO3- U
- (a) Signals from surface tissues (b) High R.F.field
- (c) High strength gradient fields (d) High strength magnetic field
7. Which of the following Radio-nuclide has half life of 6.02? CO4- U
- (a) Tc-99m (b) TI-201 (c) I-123 (d) Xe-133
8. During irradiation with X-rays, gamma rays and particle radiation, damage is caused to living cells because of _____ atoms and molecules. CO4- U
- (a) Creation (b) Destruction (c) Scattering (d) Ionisation
9. The purpose of Radiation Therapy is _____ . CO5- R
- (a) To treat Benign tumors (b) To treat malignant tumors
- (c) To treat swelling (d) To treat small intestine
10. _____ is placed on the wrist of the preferred hand. CO5- R
- (a) TLD ring dosimeter (b) Film badges (c) Pocket dosimeter (d) TLD badges

PART – B (5 x 2= 10 Marks)

11. Give the basic principles of angiography. CO1- U
12. Write a technical note on collimation. CO2- U
13. Mention the advantages of the MRI over other medical imaging modalities. CO3- U
14. What is the function of Scintillation detector? CO4- U
15. Write the clinical significance of cyber knife. CO5- U

PART – C (5 x 16= 80 Marks)

16. (a) Draw the block diagram of an X-ray machine and describe its various components in detail. CO1- U (16)
- Or
- (b) (i) Summarize the differences between Radiography and Fluoroscopy. CO1- U (8)
- (ii) Explain how image intensifier used in Fluoroscopy with neat sketch. CO1- U (8)
17. (a) Depict the block diagram of a Computer Tomography scanner and explain the various blocks in it. CO2- U (16)
- Or
- (b) (i) Explain the image reconstruction through back projection technique. CO2- U (8)
- (ii) Write short note on ultrafast CT scanners. CO2- U (8)
18. (a) Draw the block diagram of a MRI system and explain the image reconstruction using it. CO3- U (16)
- Or
- (b) (i) Explain the three principle MRI parameters with regard to relaxation processes. CO3- U (8)
- (ii) Write short note on MRI. CO3- U (8)
19. (a) With neat sketch explain how a Gamma-ray camera is used to detect and scan the gamma rays emitted from a patient who has been injected with a radio isotope. CO4- U (16)
- Or
- (b) Explain the principles of PET and SPECT with relevant sketch and clinical applications. CO4- U (16)
20. (a) Explain the 3DCRT and IMRT techniques in radiation therapy. CO5- U (16)
- Or
- (b) (i) Explain the functioning of Thermo Luminescent dosimeter. CO5- U (8)
- (ii) Briefly point out the 'Radiation Protection in medicine'. CO5- U (8)

