

(3 Hours)

[Marks : 80]

- Note: 1) Question no 1 is compulsory  
 2) Attempt any three questions from remaining five questions  
 3) Figures to right indicate full marks

- Q.1 State with reasons whether following statements are true or false 20
- A CT number for water is zero
  - B In spin-echo pulse sequence 90 degree RF pulse is used for echo generation
  - C Third generation of CT is called as Rotate-stationary generation.
  - D During relaxation process in MRI, current induced in receiver coil is minimum when protons are in parallel with main magnetic field.
  - E Pencil beam CT scanner is less likely to record scattered radiation than fan beam scanner.
- Q.2 A Explain construction and working of any two types of CT detectors 08
- B Explain the working of Superconducting Magnet and state its advantages. 07
- C A sample has a  $T_1$  of 3 sec. If the net magnetization is set equal to zero, how long will it take for the net magnetization to recover its 80 % of equilibrium value? 05
- Q.3 A How slice selection take place in MRI? Explain phase and frequency encoding in detail with diagrams. 12
- B Explain the technology behind Spiral CT scanner and state its advantages over conventional CT scanner. Define Pitch Factor. 08
- Q.4 A List and state the purpose of measuring Different types of metabolites in MRS. 10
- B Obtain the projections of following image using ray-by-ray reconstruction 10
- |   |   |
|---|---|
| 2 | 3 |
| 4 | 7 |
- Q.5 A Derive the Larmor Equation and state the importance of Larmor frequency. 10
- B A beam of 2000 photon is directed at phantom of thickness 2 cm. having attenuation coefficient  $\mu=0.5 \text{ cm}^{-1}$ . Calculate the number of photons detected by the detector at the other end of the phantom. Also calculate the CT number of the block. 10
- ( $\mu_{\text{water}} = 0.19 \text{ cm}^{-1}$ )
- Q.6 Write short note on (any four) 20
- A Inversion recovery pulse sequence
  - B CT Angiography
  - C Biological Effects of MRI
  - D  $T_2$  Relaxation and its importance
  - E CT artifacts

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