

GANPAT UNIVERSITY

B.Tech. Sem V (BM & I), Regular Examination NOV/DEC 2010

BME 501 Principles of Biomedical Imaging and Radiology

Time: 3 Hours

Marks: 70

Instructions:

1. All the questions are compulsory.
2. Answer to the question of each section must write in separate answer books.
3. Figures to the right indicate marks.
4. Assume data, if needed.
5. Conventional terms/notations are used.

SECTION-I

- Q.1 (a) List the factors that affect the x-ray emission spectrum and briefly describe how the spectrum is affected by each factor. [06]
- (b) Explain internal structure of x-ray tube. [06]
- OR**
- Q.1 (a) Explain basic ways of x-ray interaction with matter. [06]
- (b) Explain or define following terms [06]
- (1) Heel effect
 - (2) Extra focal radiation
 - (3) Bremsstrahlung Radiation
- Q.2 (a) Explain Grid characteristics. [06]
- (b) Write short note on radiographic film. [06]
- OR**
- Q.2 (a) Write short note on Beam Restricting devices. [06]
- (b) Explain radiographic exposure factors for x-ray quality. [06]
- Q.3 (a) Explain generations of Computed Tomography. [08]
- (b) Write short note on Digital Radiology. [03]

SECTION-II

- Q.4 (a) Give reasons: [06]
 (i) Bones and lungs cannot be imaged by US waves.
 (ii) Layer of jelly is kept between US beam and skin surface while imaging.
- (b) Explain acoustic impedance and its effect on reflection of US beam. [06]
- OR**
- Q.4 (a) Derive the expression of the piezoelectric US transducer for pressure dissipation along axial distance. [06]
 (b) Give principle of MRI and explain it in detail. [06]
- Q.5 (a) Define US wave intensity and explain it in detail [06]
 (b) An acoustic beam is reflected at boundary between 2 types of body tissues with 4% intensity reflection coefficient (a) find the ratio of acoustic impedance of two tissues. Assume the US beam is incident at right angle to the interface boundary.(b)if the angle of beam is decrease from 90 such that the transmitted US beam intensity reduces to 0 at an angle of 60 degree, calculate the ratio of velocity of US beam in two tissues. If the ratio of densities of two medium is $\sqrt{3}:1$.Find which of the two tissues medium has the higher impedance? [06]
- OR**
- Q.5 (a) Explain US beam scattering in tissue. Explain technical terms for evaluation of scattering effect. [06]
 (b) Explain the A mode US imaging in detail including signal compression and TGC. [06]
- Q.6 (a) Give the difference between SPECT and PET also Explain PET in detail [06]
 (b) Give Specifications that the following are true or false [05]
 (i)Aliasing is not a problem with color flow imaging.
 (ii)A-Mode is mainly used to measure distance.
 (iii)The intensity reflection coefficient depends on acoustic impedance mismatch.
 (iv)Velocity of sound in a medium is constant regardless of frequency.
 (v)Temperature is an acoustic variable.

'END OF PAPER'