GANPAT UNIVERSITY
B.Tech. Semester VI (BM&I), April - June 2015
2BM601 : Biomedical Imaging and Radiology

Time:- 3 Hours

Marks:- 70

Instructions:
1. Answer to the each sections must be written in separate answer books.
2. Figure to the right indicate marks.
3. Conventional terms / notations are used.
4. All the questions are compulsory.

SECTION-I

Q.1

A. A 1 MHz US wave with initial intensity 100 mW/cm^2 (RMS) is travelling through fat. (We shall assume initially that we have a semi-infinite slab so that there is no reflected component.) Calculate: (a) the initial peak pressure, (b) the initial maximum velocity of oscillation of the particles, (c) the initial maximum displacement. Now suppose that, the beam hits a barrier with muscle 3cm from the starting point. Calculate: (d) the intensity of the reflected beam. The tissue properties are: fat δ= 940 kg/m3, c = 1480 m/s, α(amplitude) = 0.07 cm^{-1}; muscle δ = 1070 kg/m3, c = 1566 m/s, α(amplitude) = 0.15 cm^{-1}.   7

B. Give the difference between absorption, attenuation and scattering.   5

OR

Q.1

A. A 8 MHZ beam of Ultrasound travels from soft tissue into fat. Calculate the wavelength in each medium and percentage wavelength change. For soft tissue speed of sound is 1540 m/s and for fat it is 1450 m/s.   4

B. Explain the basic theory of ultrasound.   4

C. Calculate the remaining intensity of 100mW U/S pulse that lose 40 dB while travelling through tissue.   4

Q.2

A. For a beam with a 2 khz pulse repetition frequency what is the corresponding PRP and maximum range?.speed of sound in soft tissue =1540 m/s.   5

B. Write short note on Ultrasound probes.   6

OR

Q.2

A. Write short note on B mode scan   6

B. Explain Doppler effect using an example   5

Q.3

A. Find the half value thickness for ultrasound?   4

B. Derive wave equations for plane waves and spherical waves and also give their general solution.   4

C. Explain pulse echo imaging   4

Q.4

A.   Explain in detail the production of X-rays.   6

B.   Explain in detail X-ray filtrations.   6

OR

Q.4

A.

    i)   What is HVL?   2

    ii)   Define atomic number and mass number.   2

    iii)   Give the names of types or products of an ionizing radiation.   2

B.

    i)   What is the difference between ionizing and non-ionizing radiation.   3

    ii)   What is x-ray and what are gamma rays? Give the difference between two.   3

Q.5

A.   Explain in detail discrete X-ray spectrum and continuous X-ray spectrum.   6

B.   Explain in detail characteristic radiation.   5

OR

Q.5

A.   Describe the factors affecting the size and relative position of the X-ray emission spectrum.   6

B.   Write a short note on digital subtraction angiography.   5

Q.6

A.   Explain in detail the factors affecting x-ray quality.   6

B.   Write Short note on fluoroscopy.   6

END OF PAPER