Student Exam No............

GANPAT UNIVERSITY

B.Tech. Semester –V BIOMEDICAL & INSTRUMENTATION ENGINEERING

Regular Examination NOV – DEC 2011.

BME 501: Principles of Biomedical Imaging and Radiology

Time:- 3 Hours   Total Marks:- 70

Instructions:
1. Answer to the questions 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

Que.1   12

(a) i)   As the distance from the source is doubled ,the intensity of radiation is _____ ,and conversely when the distance from the source is halved the intensity of radiation is _____.

ii) The known electromagnetic spectrum has three regions of importance to radiography: _____ , _____ , and _____ .

iii) What is difference between x-rays and gamma rays?

iv) The radiographic table must be radiolucent .Define radiolucent.

v)   In an examination of a pediatric patient the controls are set at 600mA at 30 milliseconds.What is the mAs?

vi) The space charge electrons all have the same mass and, therefore the same kinetic energy .How is the kinetic energy of the electrons streaming across the x-ray tube increased to increase the intensity and energy level of the x-ray beam?

vii) What is the importance of K-characteristic x-rays in forming a diagnostic radiograph?

(b) Explain units of Ionizing radiation.

OR

Que.1   12

(a) Draw the diagram and write the description of the formation of bremsstrahlung radiation.

(b) List the factors that affect the x-ray emission spectrum and briefly describe how the spectrum is affected by each other?

(c) Write short note on Xeroradiography

Que.2   11

(a) Explain characteristics of grid

(b) Write short note on angiography.

OR

Que.2   11

(a) i)   What is line focus principle?

ii) What is heel effect?

(b) i)   Why bones are seen as bright area and muscles are seen as dark area on an x-ray?

ii) Write advantages and disadvantages of rotating anode.

Que.3

(a) Write short note on A mode display of Ultrasound machine.

(b) Write a short note on fluoroscopy.

SECTION-II

12

Que.4

(a) An acoustic beam is reflected at the boundary between two types of body tissues, with 4% intensity reflection co-efficient. Find the ratio of the acoustic impedance of the two types of body tissues. Assume that the U.S beam is incident at right angle to the boundary. If the angle of the beam is decreased from 90 degree such that the transmitted U.S beam intensity becomes zero at an angle of 60 degree, calculate ratio of velocity of U.s beam in two tissues. If the ratio of the density of two tissues (mediums) is √3:1,find which of the two tissues has higher impedence?

(b) Write short note on ultrasound contrast media.

OR

12

Que.4

(a) Explain the following: (1) Attenuation coefficient (2) Absorption coefficient of U.S wave. Discuss their significance in using for imaging biological tissues.

(b) Write short note on (i) SPECT (ii) PET

11

Que.5

(a) Describe principle of MRI, and also explain it with detail.

(b) Compare and contrast all generations of CT scan machine

OR

11

Que.5

(a) Give the absorption co-efficient of U.S wave by following body tissues.(1) Blood (2) fat (3) Liver (4) muscle (5) bone (6) lungs

(b) Define reflection coefficient and transmission coefficient considering U.S wave as a pressure wave. Obtain their relevant expression

12

Que.6

(a) A plane ultrasonic wave with an initial temporal average intensity of 100 mw/cm² is being propagated into heart.It has two traverses 1 cm of fat and 2 cm of heart muscles before reaching the heart valve to image. Calculate the intensity of Us wave at the heart valve for frequency
  i) 3 MHZ
  ii) 6 MHZ
Attenuation co-efficient for fat and heart muscle are given as .35 and 0.06 neper/cm at 1 MHZ

(b) Write principle of Doppler ultrasound and describe it in detail.

END OF PAPER