

GANPAT UNIVERSITY

B.TECH SEM. VI BIOMEDICAL & INSTRUMENTATION ENGINEERING

CBCS REGULAR EXAMINATION MAY/JUNE - 2013

2BM601 BIOMEDICAL IMAGING AND RADIOLOGY

TIME : 3 HOURS

TOTAL MARKS: 70

INSTRUCTION:

1. Write each section in separate answer books.
2. All questions are compulsory.
3. Draw figures and assume data wherever necessary.
4. Conventional terms / notations are used.
5. Figure to the right indicate marks.

Section - I

- Q.1 [12]
a) Define X-ray quality, hard and soft x-rays. What is half value layer and how it can be determined. Explain factors affecting x-ray quality with necessary graphs (6)
b) What is differential absorption? Explain probability curves of bone and tissues and write formulas for Compton and photoelectric interactions. Explain how radiographic image of bones and lungs are obtained. (6)

OR

- Q.1 [12]
a) Enlist and explain constructional parts of conventional radiographic film. Describe the procedure for the formation of latent image on it? Write related equations (6)
b) Enlist and explain factors affecting scattered radiations. How grids are used to improve image quality. Define grid cutoff? (6)

- Q.2 [11]
a) Why internal structure of X-ray tube is enclosed in vacuum. Explain phenomenon of thermionic emission and space charge effect. With the help of graph explain how tube current is influenced by filament current. Why no tube current flows initially when x-ray unit is first turned on. (6)
b) Define ionizing radiation and give its classification? Write different SI and traditional units used for its measurement? Give related equations. (5)

OR

- Q.2 [11]
a) Explain methods used for X-ray generation. Distinguish between them. Draw labeled energy spectrum if 2 x-ray unit's one containing tungsten and other molybdenum as target is energized at 90 KVP. (6)
b) Explain line focus principle and heel effect in X-ray. How heel effect is useful in chest radiography and abdominal imaging (5)

Q.3 Write short note on (Any three)

[12]

- a) Mammography
- b) Digital subtraction Angiography
- c) Xeroradiography
- d) Computed radiography

Section – II

Q.4

[12]

- a). With the help of block diagram explain pulse-echo system. How distance of the tissue interface can be measured from ultrasonic echoes obtained by the receiver. (6)
- b). Draw figure of various scanning arrangement that can be used in B-mode. Explain mechanical scanner used in real time B-mode imaging system with its disadvantages. Distinguish the real time with manual B-mode system? (6)

OR

Q.4

[12]

- a). Write the formulas for ultrasonic intensity reflection and transmission coefficient at the tissue interface. An ultrasound beam (US) is reflected at the boundary between two types of body tissues with 4 % intensity reflection coefficient. Find the ratio of acoustic impedances of the two tissues. Assume US beam intensity at right angle to the boundary. (6)
- b). Derive the formula for Doppler shift. How continuous wave Doppler system can be used for blood velocity measurement. (6)

Q.5

[11]

- a). Distinguish between fluoroscopic and radiographic equipment. Draw a neat diagram and explain image intensifier tube. What is spot filming (6)
- b). Draw a neat labeled diagram and Explain different parts of single ultrasonic transducer. (5)

OR

Q.5

[11]

- a). State Huygens's principle. Draw and explain transverse and axial beam profiles for continuous and pulsed ultrasonic waves. Explain radiation intensity beam pattern in far field. (6)
- b). Who discovered X-rays? Write its harmful biological effects. State and explain primary devices used for minimizing radiation exposure of x-rays. (5)

Q.6 Write short note on (Any three)

[12]

- a). 2 D echocardiography
- b). Intracavity ultrasonic imaging
- c). Color Doppler
- d). Multi-element linear array scanners of ultrasound

-----END OF PAPER-----