Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (BME)/SEM-5/BME-504/2009-10

2009

MEDICAL IMAGING – I

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives of the following : $10 \times 1 = 10$

i) Scintillator detector is

a) CsI b) Xe gas

c) photomultiplier tube d) none of these.

ii) "REM" indicates

a) absorption of incident energy

b) relative biological damage

c) maximum permissible dose

d) intensity of *X*-ray energy.

iii) *X*-ray absorption depends on the

a) density of the material

b) conductivity of the material

c) thermal property of the material

d) none of these.

iv) Filament of *X*-ray tube produces

a) electrons b) *X*-ray radiation

c) γ-ray radiation d) β-ray radiation.

v) A material having high reflectivity in the visible light will be of

a) low emissivity b) high emissivity

c) moderate emissivity d) none of these.

vi) Radiation therapy *X*-ray tubes have

a) low kV and high mA

b) short exposure time

c) high kV and high mA

d) low kV and high exposure time.

vii) Roentgen (*R*) expresses

a) incident *X*-ray energy

b) absorbed energy

c) *X*-ray dose equivalent

d) *X*-ray dose rate.

viii) Low kV technique is used for

a) Chest and lungs studies

b) Cholecystography

c) Bronchography

d) Mamography.

ix) The image intensifier is made of

a) zinc cadmium oxide

b) zinc cadmium phosphite

c) cesium iodide

d) cesium oxide.

x) In scintillation detector which ray cannot be detected directly ?

a) α-ray b) β-ray

c) Both α- and β-rays d) γ-ray.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What is digital radiography ? Briefly describe the working principle of an image intensifier tube. 1 + 4
3. What are the detectors commonly used in digital *X*-ray radiography ? Briefly describe the working principle of scintillator detector coupled with photomultiplier tube.
4. Draw and label an *X*-ray tube with construction material. Mention the important factors for *X*-ray generation. 3 + 2
5. What is the utility of automatic exposure control ? Describe the various methods used in *X*-ray exposure using this method. 1 + 4
6. What is 'angiography' ? Briefly discuss about the Digital Subtraction Angiography (DSA) technique. 1 + 4

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What is the function of an 'exposure timer' in *X*-ray radiographic sytem ? How does R-C and digital timer work ? 1 + 6

   b) Why are collimators and grids essential parts/devices in *X*-ray radiographic unit ? 6

   c) Why is rotating anode plate used in high capacity *X*-ray tube ? 2

8. Draw the electrical circuit diagram for conventional *X*-ray machine. Describe briefly the major sections for conventional *X*-ray machine. What are the limitations of single phase power supply in *X*-ray radiographic unit ? How is it overcome ? 4 + 5 + 2 + 4

9. What is the basic principle of thermographic imaging ? What are the detectors used in thermographic imaging ? Briefly describe a thermographic imaging technique or equipment. What are the advantages of thermographic imaging over radiographic imaging ? 3 + 3 + 7 + 2

10. Write short notes on any *three* of the following : 3 × 5

    a) Physical factors of theremographic imaging

    b) *X*-ray mammography technique

    c) Liquid crystal thermography

    d) Cineradiography

    e) Digital *C*-arm radiographic system.

11. What are the limitations of *X*-ray machine in radiation therapy ? Why is cobalt (Co) put to medical use and how is it obtained and used in therapy ? Briefly describe the cobalt (Co) radiation therapy with proper diagram. What precautions you must take for radiotherapy ? 2 + 4 + 6 + 3