Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(BME)/SEM-5/BME-504/2011-12

2011

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 for the following : $10 \times 1 = 10$

   i) The Collimator in an *X*-ray system is located
      a) before the *X*-ray tube
      b) after the *X*-ray tube
      c) after the Grid
      d) after the *X*-ray film.

   ii) REM indicates
      a) maximum permissible dose
      b) absorbed dose
      c) dose equivalent
      d) relative biological damage.

   iii) Low KV technique is used for
      a) Bronchography b) Cholisyestography
      c) Mammography d) Bone studies.

   iv) The propagation speed of diagnostic *X*-ray is
      a) 3×10^6 mtrs/sec b) 6×10^4 mtrs/sec
      c) 4×10^3 mtrs/sec d) 3×10^8 mtrs/sec.

v) A Geiger Muller Counter is
   a) Semiconductor detector
   b) Scintillation detector
   c) Ionization chamber detector
   d) Solid state detector.

vi) Which one of the following is stable isotope of Cobalt (Co) ?
   a) ^{60}Co b) ^{59}Co
   c) ^{61}Co d) ^{58}Co .

vii) A material having high reflectivity in visible light will show
   a) low emissivity b) high emissivity
   c) moderate emissivity d) none of these.

viii) Which one of the following is an example of scintillator detector ?
   a) CsI(TI)
   b) Xe gas
   c) Photo multiplier Tube (PMT)
   d) None of these.

ix) The filament wire of *X*-ray tube is usually made of
   a) alluminium wire b) copper wire
   c) tungsten wire d) none of these.

x) X-ray absorption is depends on the
   a) density of the material
   b) conductivity of the material
   c) thermal property of the material
   d) none of these.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following $3 \times 5 = 15$

2. What is Bremsstrahlung ? Explain with a drawing how it results in production of *X*-rays. 1 + 4
3. Describe two methods for automatic exposure timer release.

4. What is the difference between diagnostic and therapeutic radiography ? How does *X*-ray tube current, voltage and duration of exposure differ ? 2 + 3
5. Explain the function of Collimators and Grid in diagnostic radiography.
6. What are the detectors commonly used in digital *X*-ray radiography ? Briefly describe the working principle of scintillator detector coupled with Photo Multiplier Tube.
7. What is digital radiography ? Briefly describe the working principle of an image intensifier tube. 1 + 4

GROUP – C
(Long Answer Type Questions)

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

8. a) Briefly describe the circuitry of electrical power supply of an *X*-ray machine. 9
   b) What are the limitations of single phase power supply in *X*-ray radiographic unit ? How is it overcome ? 2 + 4
9. a) What is the basic principle of thermographic imaging ? 3
   b) What are the detectors used in thermographic imaging ? 3
   c) Briefly describe a thermographic imaging technique or equipment. 7
   d) What are the advantages of thermographic imaging over radiographic imaging ? 2
10. a) What is a 'Mask' referred to in DSA ? Explain in detail the principle of DSA. 8
    b) Name and explain a programme by which the route of the catheter is pre-determined in a DSA system. 4
    c) Mention three advantages of a DSA to the Medical Doctor (end user). 3
11. a) What are the limitations of X-ray machine in radiation therapy ? 2
    b) Why is cobalt (Co) put to medical use and how is it obtained and used in therapy ? 4

c) Briefly describe the cobalt (Co) radiation therapy with proper diagram. 6

d) What are the basic differences between Medical Linear Accelerator and cobalt (Co) radiation unit ? 3

12. a) What is angiography ? How is it done ? 4

b) Draw a diagram of a digital *C*-arm fluoroscopy system and label the parts. 7

c) In which area of the hospital is it used ? Name two medical procedures for which it has to be necessarily used. 4

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

a) Brachytherapy

b) Liquid crystal thermography

c) *X*-ray high KV technique and application

d) Cineradiography

e) Digital *C*-arm radiographic system.

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