



B.Tech. (Full Time) END SEMESTER DEGREE EXAMINATION, APRIL / MAY 2014

**BIOMEDICAL ENGINEERING
Second Semester**

BM 8203 MEDICAL PHYSICS

(Regulation 2012)

Time : 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What do you mean by non-ionizing radiation? Give example?
2. What type of radiation is used for Hyperthermia treatment?
3. What will be the wavelength of 10MHz frequency ultrasound, when travelling in blood medium? Given density and velocity of ultrasound in blood is 1,058 Kg/m³ and 1.56 mm/ μ s respectively.
4. What is the significance of acoustic impedance in ultrasonic imaging?
5. What is the role of moderators in nuclear reactor and what materials are used as moderator?
6. If a radionuclide decays at 1% per hour, about how long it will take to decay to one-half of its original activity?
7. Obtain the relationship connecting HVL and TVL?
8. If half life of a radionuclide is 74 days, What will be the decay constant?
9. What is the SI unit of radiation dose equivalent? Give relationship connecting old unit.
10. Define radiation exposure? Give its SI unit?

Part - B (5 x 16 = 80 marks)

11. (i) Write short note on Stochastic effect and Non-stochastic effect, with example. (6)
(ii) Write short note on Bremsstrahlung and characteristic radiations? (6)
(iii) Calculate the exposure rate at 10cm and 300 cm distances from a syringe containing 30mCi of ^{99m}Tc. (Given Γ factor=0.6 R.cm²/mCi/hour). (4)
 12. (a)(i) Explain in detail about MRI and how images are formed using radiofrequency waves? What are the clinical applications? (7+3)
(ii) Compare MRI with PET? (6)
- OR**
- (b)(i) What are the biological effects of various non-ionizing radiations? (8)
(ii) Discuss medical applications of Thermography. (8)

13. (a)(i) Explain the construction and working of Ultrasonic transducer and explain molecular dipole changes during ultrasound production in the piezoelectric crystal? (11)
(ii) Can we do ultrasonic scan of skull bone with the acoustic impedance value of $0.0004 \times 10^5 \text{ Kg/m}^2 \cdot \text{sec}$ and $7.8 \times 10^5 \text{ Kg/m}^2 \cdot \text{sec}$ respectively. Justify your answer from the results. (5)

OR

- (b)(i) Explain how the characteristic features of ultrasound affects the quality of ultrasound image? (12)
(ii) What do you mean by Cavitation in Ultrasound imaging and how it forms? (4)

14. (a) Describe the principle, construction and working of Technetium-99m generator with neat diagram?

OR

- (b)(i) Explain alpha decay, beta decay, electron capture and gamma decay with suitable examples. (8)
(ii) Explain the working of Cyclotron particle accelerator with neat diagram. (8)

15. (a) Discuss interaction of electromagnetic radiation with matter with its salient features.

OR

- (b) (i) Explain interaction of fast neutrons with matter? (12)
(ii) Write short note on annihilation radiation. (4)
