Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.TECH/BME/SEM-7/BME-704A/2012-13

2012
LASER AND FIBRE OPTICS IN MEDICINE

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 operation wavelength of He-Ne laser is

          a)   488·5 nm   b)   514·8 nm

          c)   632·8 nm   d)   none of these.

    ii)   The CO_2 laser produces a beam of

          a)   IR light   b)   U-V light

          c)   Visible light   d)   None of these.

    iii) Argon laser is a

          a)   Molecular laser   b)   Ionic laser

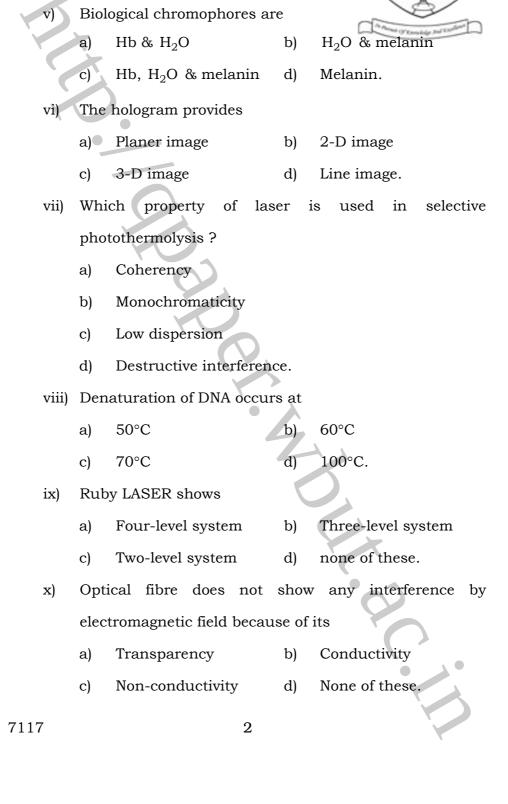   c)   Atomic laser   d)   Solid state laser.

    iv)   Principal optical properties of biological tissue are

          a)   Reflection   b)   Absorption

          c)   Scattering   d)   None of these.

v) Biological chromophores are

   a) Hb & H_2O b) H_2O & melanin

   c) Hb, H_2O & melanin   d) Melanin.

vi) The hologram provides

   a) Planer image   b) 2-D image

   c) 3-D image   d) Line image.

vii) Which property of laser is used in selective photothermolysis ?

   a) Coherency

   b) Monochromaticity

   c) Low dispersion

   d) Destructive interference.

viii) Denaturation of DNA occurs at

   a) 50°C   b) 60°C

   c) 70°C   d) 100°C.

ix) Ruby LASER shows

   a) Four-level system   b) Three-level system

   c) Two-level system   d) none of these.

x) Optical fibre does not show any interference by electromagnetic field because of its

   a) Transparency   b) Conductivity

   c) Non-conductivity   d) None of these.

GROUP – B

(Short Answer Type Questions)

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

2. What are optical pumping and population inversion ? Why optical pumping is not preferred in gas lasers ? $3 + 2$

3. Define population inversion. How is it achieved ? $2 + 3$

4. Define Holography. What is the difference between holography & photography ? $2 + 3$

5. Write the physical significance of Einstein coefficients. What is the difference between stimulated and spontaneous emissions ? $3 + 2$

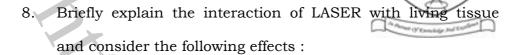6. Briefly discuss about the coherency and monochromatic property of the LASER. 5

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Write down the basic concept of LASER by showing different energy level diagrams.

   b) Briefly discuss the term 'Population Inversion' by showing different energy states.

   c) Find out the relation between 'stimulated emission' and 'spontaneous emission' rate by using Einstein equation and Boltzman equation.

8. Briefly explain the interaction of LASER with living tissue and consider the following effects :

   a)   Thermal effect

   b)   Mechanical effect

   c)   Photo-ablative and photo-dynamic effects.

9. Discuss with suitable diagrams the principle, construction and working of He-Ne laser. Explain the role of the atom in it. How is it superior to Ruby laser ?   9 + 4 + 2

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

    a)   LASER in Ophthalmology

    b)   LASER in Dermatology

    c)   LASER in Dentistry

    d)   LASER flow cytometry.