Name :	
Roll No. :	Conformation and Excellent
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)

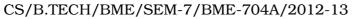
- 1. Choose the correct alternatives for the following : $10 \times 1 = 10$
 - i) The operation wavelength of He-Ne laser is
 - a) 488.5 nm b) 514.8 nm
 - c) 632·8 nm d) none of these.

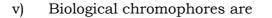
ii) The CO_2 laser produces a beam of

- 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.

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- a) Hb & H₂O
- 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 ?

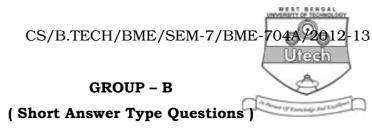
b)

- 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.
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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
- Write the physical significance of Einstein coefficients. What is the difference between stimulated and spontaneous emissions ?
 3 + 2
- Briefly discuss about the coherency and monochromatic property of the LASER.
 5

GROUP – C

(Long Answer Type Questions)

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

- 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.

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- 8. Briefly explain the interaction of LASER with living 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.