

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – SUMMER 2022****Subject Code:3170314****Date:10/06/2022****Subject Name:LASER and Fiber Optics in Medical Technology****Time:02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

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|------------|-----|-------------------------------------------------------------------------------------------------------------|-----------|
| Q.1 | (a) | Define the following terms (i) Numerical Aperture (ii) Critical Angle | 03 |
| | (b) | State the Snell's Law with necessary equations. | 04 |
| | (c) | Describe the Principle of LASER and briefly explain the working of Carbon Dioxide (CO ₂) LASER. | 07 |
| Q.2 | (a) | Give the difference between the Ordinary Light Source and LASER Light Source. | 03 |
| | (b) | Write a short note on Classifications of LASER. | 04 |
| | (c) | Explain the Losses and Dispersion in the Optical Fiber Cable in detail with necessary diagrams. | 07 |
| OR | | | |
| | (c) | Explain the propagation of light along straight transparent and bend slab. | 07 |
| Q.3 | (a) | Enlist the Medical Lasers with their applications. | 03 |
| | (b) | Write a short note on Fluorescence endoscopy. | 04 |
| | (c) | Explain therapy by Thermal Interaction between Lasers and Tissue. | 07 |
| OR | | | |
| Q.3 | (a) | Enlist the possible complications in the use of Laser Fiber Optic System. | 03 |
| | (b) | Write a technical note on Fiber Optic Biomedical Sensor. | 04 |
| | (c) | Explain the Integrated Laser-Fiber Systems with their applications. | 07 |
| Q.4 | (a) | Define the following terms (i) Refraction of Light (ii) Cleaving | 03 |
| | (b) | Write a short note on Angioscope. | 04 |
| | (c) | Explain the Endoscopic Imaging Systems in detail with necessary schematics. | 07 |
| OR | | | |
| Q.4 | (a) | Enlist the different types of Connectors and Couplers used in Optical Fiber. | 03 |
| | (b) | Write a short note on Nd: YAG Laser. | 04 |
| | (c) | Explain the use of Endoscope for therapy in detail. | 07 |

- Q.5** (a) Enlist the Clinical applications of Fiber Optic Laser Systems. **03**
- (b) Light travels from air into an optical fiber with an index of refraction of 1.5. If the angle of incidence on the end of the fiber is 36° then what is the angle of refraction inside the fiber? (Consider the Refractive Index of Air is 1). **04**
- (c) Explain the Fiber Optic Laser System in Ophthalmology in detail. **07**
- OR**
- Q.5** (a) Describe the Laser Safety in brief. **03**
- (b) An optical fiber is made up of a core, where light travels, made of glass of refractive index $n_1 = 1.44$ surrounded by another layer of glass of lower refractive index n_2 then Find the refractive index n_2 of the cladding so that the critical angle at the interface core cladding is 60° . **04**
- (c) Explain the Fiber Optic Laser System in Cardiovascular disease. **07**
