

**M.TECH. LASER SCIENCE AND TECHNOLOGY FIRST YEAR SECOND
SEMESTER - 2018**

SUBJECT: LASER DAMAGE OF MATERIALS

Time: Three hours.

Full Marks : 100

Answer any *five* questions

No. of questions		Marks
1.	<p>(a) Compute the power density of a 50 mW Nd: Yag laser at 1064 nm with a 0.8 mm beam diameter. Why the damage threshold at the second harmonic (532 nm) of Nd:YAG laser will be half of that at 1064 nm?</p> <p>(b) Explain with a graph how maximum power handling capacity of glass fiber power changes with fiber diameter and pulse length.</p> <p>(c) Explain the factors on which the maximum power or energy transmitted down an optical fiber depends.</p> <p>(c)What is Brillouin scattering ? What are the basic differences between optical and acoustic phonons?</p> <p align="right">5+5+5+5</p>	
2.	<p>How the damage mechanisms in optical materials occur when intensity of light beam starts from low to very high values.</p> <p>Explain laser induced damage in optical materials. How to design of damage resistant laser?</p> <p>Explain Self-focusing and Birefringes</p> <p align="right">6+5+5+4</p>	
3.	<p>How could you define Laser Induced Damage Threshold (LIDT) of an optical component.</p> <p>Show the variation of Damage Probability with laser fluence (J/cm^2) for nanosecond pulses and how we can get an idea of defining LIDT from the plot.</p>	

	<p>Describe 1-on-1 test method for LIDT determination. What are the basic differences of 1-on-1 and R-on-1 techniques?</p> <p style="text-align: right;">6+4+8+2</p>	
4.	<p>Explain how the LIDT of coated optics is governed by the surface, material properties of the substrate and the properties of the optical coating.</p> <p>Derive the local heating in the surface of a ND glass caused by a single laser pulse, using the measured absorption coefficients.</p> <p style="text-align: right;">15+5</p>	
5.	<p>Write down the five laser damage mechanisms in tissues.</p> <p>Explain with diagram the major parts of the human eye and explain how wavelength dependent effects are observed in the eye?</p> <p style="text-align: right;">5+15</p>	
6.	<p>Explain the primary mechanisms of laser induced breakdown spectroscopy (LIBS) mentioning the involvements of ablation and luminous plasma processes.</p> <p>What are the main advantages of LIBS over other analytical methods?</p> <p>What important information we get from the measurements of LIB spectra of the soil, a heterogeneous sample?</p> <p style="text-align: right;">10+5+5</p>	