

# C.U.SHAH UNIVERSITY

## Summer Examination-2018

Subject Name: Applied Optics

Subject Code: 4SC04APO1

Branch: B.Sc. (Chemistry, Physics)

Semester: 4

Date: 08/05/2018

Time: 10:30 To 01:30

Marks: 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
  - (2) Instructions written on main answer book are strictly to be obeyed.
  - (3) Draw neat diagrams and figures (if necessary) at right places.
  - (4) Assume suitable data if needed.
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**Q-1**                      **Attempt the following questions:**                      **(14)**

- a) Define term Absorption of light.
- b) Define optical Modes.
- c) Write the formula for acceptance angle
- d) What are advantages of optical fiber?
- e) Which region has higher refractive index in optical fiber
- f) Write any two applications of Laser.
- g) Write the formula for NA.
- h) Write the formula of rate of absorption transition.
- i) Write the formula of rate of stimulated transition.
- j) What is the difference between multimode and mono mode.
- k) Write the formula of rate of spontaneous emission.
- l) What is the separation of natural light with laser light?
- m) In which process resulting emitted light is not monochromatic.
- n) Give an example of gas laser.

**Attempt any four questions from Q-2 to Q-8**

**Q-2**                      **Attempt all questions**                      **(14)**  
(a)                      What is optical cavity? Explain how the standing wave forms in optical cavity.                      **7**



	(b)	Explain the condition for stimulated emission to dominate spontaneous emission.	7
<b>Q-3</b>		<b>Attempt all questions</b>	<b>(14)</b>
	(a)	Explain the pumping scheme for laser action	8
	(b)	Explain population inversion in the production of laser.	6
<b>Q-4</b>		<b>Attempt all questions</b>	<b>(14)</b>
	(a)	Explain the principle and working of a He-Ne laser.	7
	(b)	Explain the principle and working of Nd-YAG laser.	7
<b>Q-5</b>		<b>Attempt all questions</b>	<b>(14)</b>
	(a)	Explain the principle and cross sectional view of fiber optics. What is the proper diameter of all the three regions?	8
	(b)	What are the differences between step index and graded index fiber? Explain with suitable figure.	6
<b>Q-6</b>		<b>Attempt all questions</b>	<b>(14)</b>
	(a)	In an optical fiber, the core material has refractive index 1.1 of clad material is 1.3.what is the value of critical angle? Also calculate the value of angle of acceptance.	7
	(b)	Calculate the numerical aperture and acceptance angle of an optical fiber from the following data: $n_1$ (core)=1.55 and $n_2$ (cladding) =1.50	7
<b>Q-7</b>		<b>Attempt all questions</b>	<b>(14)</b>
	(a)	Explain the spatial frequency filtering concept of Fourier optics.	7
	(b)	Explain the Fourier transforming property of a thin lens.	7
<b>Q-8</b>		<b>Attempt all questions</b>	<b>(14)</b>
	(a)	Explain operation and principle of Holography, briefly	6
	(b)	Explain the construction and formation of image by Holography technique	8

