C.U.SHAH UNIVERSITY
Summer Examination-2016

Subject Name: Laser and Fibre Optics

Subject Code: 4SC04PHC2   **Branch: B.Sc.(All)**

Semester: 4   **Date: 20/05/2016**   **Time: 02:30 To 05:30**   **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.

Q-1   **Attempt the following questions:**   **(14)**

  a) Give the full form of LASER.
  b) Name the three different processes by which light interacts with matter?
  c) Give the relation by which Einstein's coefficients B_{12}, B_{21} and A_{21} are related to each other.
  d) Define Metastable state.
  e) Name the three parts of an optical fibre.
  f) Define Numerical Aperture.
  g) State the factors on which the mode of propagation of light in an optical fibre does depend
  h) Define a Hologram.
  i) What is the principle/process on which the construction of a hologram depends?
  j) What is the principle/process on which the propagation of light in an optical fibre depends?
  k) What do you mean by Pumping?
  l) Give the applications of Laser.
  m) Define Fractional Refractive Index Change.
  n) What do you mean by a Coherent Bundle?

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

Q-2   **Attempt all questions**   **(14)**
  a) Define Holography and write the principle on which it works. Explain the process   **(7)**
         of construction of a hologram.

b)	How is a hologram different from an ordinary photograph? Explain the process of reconstruction of a hologram with a neat diagram.	**(7)**

Q-3		**Attempt all questions**	**(14)**
	a)	Give the advantages of optical fibre over traditional metal communication line.	**(4)**
	b)	Name the applications of optical fibre and explain at least one of them in detail.	**(4)**
	c)	Explain the fibre optic communication system in detail with a neat diagram.	**(6)**
Q-4		**Attempt all questions**	**(14)**
	a)	Give the differences between single mode and multi mode fibers. Explain the two different types of multimode fibers.	**(7)**
	b)	Derive the formula for acceptance angle and explain how it affects the propagation of light in an optical fibre.	**(7)**
Q-5		**Attempt all questions**	**(14)**
	a)	Define optical fiber. Give the principle on which it works.	**(4)**
	b)	Explain the principle, construction and working of a He-Ne laser with a neat diagram.	**(10)**
Q-6		**Attempt all questions**	**(14)**
	a)	Derive the Einstein's relations.	**(7)**
	b)	What do you mean by population inversion? Explain four level pumping scheme with a neat diagram.	**(7)**
Q-7		**Attempt all questions**	**(14)**
	a)	What do you mean by spontaneous emission? Explain briefly with a neat diagram. Give the characteristics of spontaneous emission.	**(5)**
	b)	Give the principle, construction and working of a Ruby laser with a neat diagram.	**(9)**
Q-8		**Attempt all questions**	**(14)**
	a)	Explain optical resonant cavity. Define active centers and active medium.	**(7)**
	b)	Explain semi conductor laser.	**(7)**