

**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.E. / B.Tech. I-Semester (Bridge Course)(Main) Examination, January 2013**

**Subject : Engineering Physics**

**Time : 3 Hours**

**Max. Marks: 75**

**Note: Answer all questions of Part - A and answer any five questions from Part-B.**

**PART – A (25 Marks)**

1. The first diffraction minima due to a single slit diffraction is at  $\theta=30^\circ$  for a light of wavelength  $5000 \text{ \AA}$ . Find the width of the slit. (2)
2. A beam of plane polarized light is changed into circularly polarized light by passing it through a slice of doubly refracting crystal of thickness  $0.003 \text{ cm}$ . Calculate the differences in refractive indices of the crystal producing birefringence. (2)
3. What is an optical fiber? Define step index fiber and explain how light is propagated through it. (3)
4. Calculate the first three permitted energy levels of an electron in a box of  $1 \text{ \AA}$  wide. ( $m=9.1 \times 10^{-31} \text{ kg}$ ,  $e=1.6 \times 10^{-19} \text{ C}$ ,  $h=6.6 \times 10^{-34} \text{ Js}$ .) (3)
5. Find the packing fraction of FCC space lattice. (2)
6. Match the following with appropriate choice
 

P	Q
(i) Primitive cell	(a) Set of parallel plates
(ii) Miller indices	(b) A reverse biased diode
(iii) LED	(c) X-ray diffraction
(iv) Bragg's law	(d) One lattice point per cell
	(e) Spontaneous emission
(A) i-d, ii-c, iii-b, iv-a	(B) i-d, ii-a, iii-e, iv-c
(C) i-c, ii-d, iii-b, iv-e	(D) i-b, ii-c, iii-d, iv-a
7. Write the properties of hard magnetic materials. (3)
8. Prove that super conductors are perfect diamagnetic materials. (2)
9. Write few application of nano materials. (2)
10. Explain the basic principle of TEM with suitable diagram. (3)

**PART – B (5x10=50 Marks)**

- 11.(a) Derive the expression for darkness and brightness for a monochromatic light beam reflected from a thin film of uniform thickness and having parallel surfaces. (7)
- (b) Explain how the two coherent light beams are obtained in the above case. (3)
- 12.(a) What is LASER stands for? (1)
- (b) With the help of energy band diagram discuss the working of a semiconductor Laser and explain merits and demerits of this laser. (9)
- 13.(a) Discuss the classical free electron theory of metals. (4)
- (b) Explain how Kronig-Penny model lead to the formation of energy bands in solids. (6)
14. Define dielectric polarization. Show that electronic polarizability is proportional to volume of the atom. (2+8)
15. What are nano materials? Describe the sol-gel method of preparation of nano materials. (2+8)
- 16.(a) What is diffraction grating? Explain how a plain transmission grating is used to determine the wavelength of light. (5+5)
- (b) Describe the double crucible method of drawing optical fibers.
17. Write notes on the following: (5+5)
  - (a) Light Emitting Diode (LED)
  - (b) Preparation of nano materials by pulsed Laser