

## Applied Physics-I-101

Sem-I

Pro-Pohement

Syll-Dec-2015

Time: 3hrs

M.M.-50

**Note:** The candidates are required to attempt three questions each from section A and B. Section C is compulsory.

**Section-A**

1. What are the characteristics of S.H.M.? Derive a general differential equation of motion for a simple harmonic oscillator. (5)
2. Under what condition damped motion becomes oscillatory? Discuss in detail the damped oscillations in a LCR circuit. (5)
3. Explain in detail the production of colors in thin films. (5)
4. What do you mean by resolving power of an optical instrument? Deduce an expression for the resolving power of a grating. (5)
5. What do you mean by polarization by double refraction? Describe the construction and working of a Nicol prism. (5)

**Section-B**

6. What is stimulated emission? Derive the Einstein's relations describing the probabilities of stimulated absorption and stimulated emission. (5)
7. Discuss the construction and working of a Ruby laser using suitable energy diagram. (5)
8. Define numerical aperture and acceptance angle. Discuss step index and graded index optical fibre. (5)
9. What do you mean by a wave function? Derive time dependent Schrodinger's wave equation. (5)
10. Solve time independent Schrodinger wave equation for a particle of mass  $m$  trapped in a one dimensional potential box of width  $L$  in order to obtain energy eigen-values. (5)

**Section-C**

11.

- (i) Explain the term quality factor.
- (ii) Discuss why two independent sources of light can never be coherent.
- (iii) What is the difference between Fraunhofer and Fresnel diffraction?
- (iv) Why thin films appear colored in white light?
- (v) Light waves can be polarised but sound waves cannot why?
- (vi) What is spontaneous emission?
- (vii) What do you understand by optical pumping?
- (viii) What are the causes of signal attenuation in optical fibre communication?
- (ix) What is expectation value?
- (x) What do you understand by tunneling effect? (10×2)