Note :   Question No. 1 is *compulsory*. Students have to attempt *five* question in total selecting at least *one* question from each Section. Each question carries equal marks.

1. (a) Why Newton's rings are circular ?   2

    (b) What are Fresnel's half period zones ?   2

    (c) Which of the polari meters (i) half shade (ii) bi-quartz is more sensitive and why ?   2

(b) Discuss the components of a optical fiber. Also discuss its types.   15

7. (a) What are *three* electric vectors in dielectrics. Find relation between them.   10

    (b) Find an expression for energy stored in electrostatic field.   10

SECTION – D

8. What are postulates of special theory of relativity using them derive equation of variation of mass with velocity. Also discuss time dilation.   20

9. (a) Write a note on BCS theory of superconductivity.   10

    (b) Describe meissner effect. Distinguish between type - I and type - II superconductors.   10

(d) Calculate the coherence time for a laser beam for which the band width is $\Delta u = 3000$ Hz. 2

(e) What is temporal coherence ? 2

(f) Calculate acceptance angle of optical fiber with $\mu_{core} = 1.62$ and $\mu_{clad} = 1.52$. 2

(g) What are multimode step index fiber ? 2

(h) Explain the term dielectric relaxation. 2

(i) The mass of a moving electron is 11 times its rest mass. Find its kinetic energy. 2

(j) Give some names of high temperature super conducting materials. 2

SECTION – A

2. Explain the formation of interference fringes by means of Fresnel's bi-prism when a monochromatic source of light is used and derive the expression for the fringe width. How will you measure the wavelength of monochromatic light using bi-prism method ? 20

3. (a) What is a zone plate ? Show that zone plate has multiple foci. 16

(b) A parallel beam of sodium light is allowed to be incident normally on a plane grating having 5000 lines/cm and a second order spectral line is observed to be deviated through 30°. Calculate the wavelength of light used. 4

SECTION – B

4. (a) Give the construction and working of a lorentz half shade polarimeter. What is its main drawback ? 14

(b) Write a note on Quarter and Half wave plate. 6

5. (a) Discuss the essential requirements for producing laser action. Describe a semiconductor laser. 14

(b) What are the specialities of a laser light. 6

SECTION – C

6. (a) Calculate the refractive indices of core and cladding material of a fiber from following data N. A = 0.22, Δ = 0.012, where N. A = Numerical aperture Δ = Fractional refractive index. 5