Assignment
Applied Physics- AP101

Note: All questions are compulsory

Q. 1

a) Describe the Newton's rings experiment in reflected monochromatic light with the help of suitable diagram. Deduce the condition for bright and dark ring.
   a) What is the shape of fringes in Newton's ring experiment? Are fringes evenly spaced?
   b) Why the centre of ring system is always dark?
   c) What happens to the diameter and shape of the fringes on introduction of a liquid between lens and glass plate.

Q. 2

a) Name some properties, which make laser light different from ordinary light.
b) Explain the concept of population inversion and discuss various pumping methods used in the Lasers for obtaining population inversion.
c) What do you mean by the terms stimulated absorption, spontaneous emission and stimulated emission?
d) Discuss the principle of operation of He-Ne Laser. Draw the energy level diagram and indicate the wavelengths of three lasing transitions.
e) Differentiate between three and four level lasers by taking suitable examples.

Q. 3

a) What is an optical fibre? Give the basic principle of light guidance through the optical fibre. Define acceptance angle and numerical aperture and hence derive mathematical relation between the two.
b) Differentiate single mode and multimode fibre.
c) What do you mean by pulse dispersion? Discuss its various types and its role in the functioning of optical fibre.
d) What do you mean by index profile of optical fibre?
e) Specify an application where Laser and optical fibre are used together.

Q. 4

a) What are Fresnel half period zones? How can half period zones be used to prove that rectilinear propagation of light is approximate.
b) What is a zone plate? How is it constructed? Show that a zone plate has a multiple foci?
c) Compare the zone plate with a convex lens.
d) What do you mean by resolving power of an optical instrument?
e) State Rayleigh's criterion of resolution.

Q. 5

a) What is an ideal simple pendulum? Write expression for its time period.
b) Show that the total energy in S.H.M. is constant. Draw a graph showing the variation of K.E., P.E. and Total Energy of S.H.M.
c) What are free oscillations and damped oscillations? Draw graphs to represent each.
d) Show that simple harmonic motion may be considered as the projection of uniform circular motion along the diameter of the circular path. Hence derive expression for the displacement of a particle in S.H.M.