Code No: 19SHT104 **R19**

**I B. Tech I Semester Regular Examinations, Jan - 2020**
**APPLIED PHYSICS**
(Common to EEE and ECE Branches)

Time: 3 hours Max. Marks: 60

**Note:** Answer **ONE** question from each unit (**5 × 12 = 60 Marks)**

## UNIT - I

1. a) Define coherent sources and discuss the conditions for sustained interference pattern of light. (2M)
   b) Derive an expression for the radius of curvature 'R' of plano-convex lens illuminated by a monochromatic source of wavelength 'λ' in the Newton's rings experiment. (8M)
   c) In Newton's ring experiment, the diameters of the $4^{th}$ and $12^{th}$ dark rings are 0.40 cm and 0.70 cm, respectively. Find the diameter of $20^{th}$ dark ring. (2M)

**(OR)**

2. a) Specify any two major differences between interference and diffraction phenomena. (2M)
   b) Derive an expression for the intensity of Fraunhofer diffraction produced by double slit and sketch the intensity distribution profile. The distance between the centers of two slits is given by ' e+*d* ' and width of each slit is '*e*'. (8M)
   c) A plane transmission Grating has 20,000 lines per inch over a length of 8 inches. Find the resolving power of the Grating for the second order spectrum. (2M)

## UNIT – II

3. a) What is population inversion? Explain the necessity of population inversion for lasing action in brief. (2M)
   b) What are the Einstein's coefficients and derive the relation between Einstein's coefficients 'A' and 'B'? State the necessary condition for stimulated emission. (10M)

**(OR)**

4. a) What is the basic principle of holography? (2M)
   b) Discuss the construction and reconstruction of hologram. (8M)
   c) Mention any four applications of holography. (2M)

## UNIT – III

5. a) Explain the magnetic hysteresis of B-H curve in a ferromagnetic material. (6M)
   b) Give the characteristic properties and applications of hard and soft magnetic materials? (6M)

**(OR)**

6. a) What is meant by dielectric loss? State its importance. (4M)
   b) Explain briefly the various types of polarization mechanisms in dielectrics and sketch their dependence on the frequency of the applied electric field. (8M)

7. a) Discuss the G.P. Thomson experiment in detail to demonstrate that particles behave like waves. (10M)
   b) Determine the wavelength associated with an electron having kinetic energy equal to 1 MeV. (2M)

**(OR)**

8. a) Give the statement of Heisenberg's uncertainty principle. Discuss its significance. (2M)
   b) Explain the physical significance of wave function. (2M)
   c) Obtain the expressions for energy of a particle enclosed in one-dimensional infinite potential box. (8M)

**UNIT –V**

9. a) What are *n*-type and *p*-type semiconductors? How are they produced? (2M)
   b) Obtain an expression for the carrier density of an intrinsic semiconductor. (10M)

**(OR)**

10. a) Explain the phenomena of diffusion of charge carriers in semiconductors. (2M)
    b) What is Hall effect? Briefly discuss the physical origin of Hall effect. (6M)
    c) Show that for a *p*-type semiconductor the Hall coefficient is given by $R_H = \frac{1}{ne}$. (4M)

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