Seat No. _____

HS-2

B. Sc. (Sem. II) (CBCS) (W.E.F. 2019) Examination
May - 2023
Physics : Paper - 201
(Wave, Optics & Semiconductor Devices) (New Course)

Time : $2\frac{1}{2}$ / Total Marks : **70**

Instructions :
(1) All questions are compulsory.
(2) Symbols have their usual meaning.
(3) The number on the right side indicate the marks.

1 (a) Give the correct answers of following questions :   **4**
    (1) Write the mathematical equation of stationary wave.
    (2) Define Doppler effect.
    (3) Write the frequency range of audio waves.
    (4) The amplitude at antinodes point is _____

(b) Answer the following : (answer any one)   **2**

    (1) A wave is represented by $y = 0.5 \sin \dfrac{2\pi}{0.8}(60\,t - x)$.

       Find (1) Amplitude (2) wavelength (3) Velocity.

    (2) A 5m long string of mass 5g is stretched by force 50N. Find the velocity of transverse wave travels along the string.

(c) Answer in detail : (any one)   **3**
    (1) Explain the formation of standing waves.
    (2) Explain the formation of Beats.

(d) Write a note on : (answer any one)   **5**
    (1) Derive Newton's formula for velocity of sound wave in gas with Laplace's correction.
    (2) Derive an equation for velocity of transverse wave travel in stretched string.

2 (a) Give the correct answers of following questions :   **4**
   - (1) In full wave bridge rectifier, how many diodes are required ?
   - (2) The capacitive reactance for d.c. is _____.
   - (3) Write the relation between α and β in CE transistor connection.
   - (4) How many P-N junction are formed in Transistor ?

(b) Answer the following : (answer any one)   **2**
   - (1) A power supply delivers 20 $V_{d.c.}$ with ac component (ripple) of Vrms = 0.8V. Find the value of ripple factor.
   - (2) In Ce transistor circuit, calculate I_C for given $\beta = 70$ and $I_B = 25\ \mu A$.

(c) Answer in detail : (answer any one)   **3**
   - (1) Explain the capacitor filter in detail.
   - (2) In common base transistor connection, the voltage drop across R_c is 4V. Find the value of base current. [Given : $\alpha = 0.96$, $R_C = 2K\Omega$].

(d) Write a note on : (answer any one)   **5**
   - (1) What is diode rectifier ? Explain half wave rectifier with necessary circuit diagram.
   - (2) Describe the input and output characteristic of CE transistor connection.

3 (a) Give the correct answers of following questions :   **4**
   - (1) Newton's ring illustrates the phenomenon of _____.
   - (2) Write the formula for the fringe width in Lloyd's single mirror experiment.
   - (3) The velocity of light is minimum in vacuum. (true/false)
   - (4) The central region in Newton's ring is _____.

(b) Answer the following : (answer any one)   **2**
   - (1) Distance between two slits 0.01 cm and the width of fringes formed on the screen is 0.52 cm, if the distance between the screen and slit is 1m. find the wavelength of light used.
   - (2) In the Newton's ring experiment, the diameter of the 4th rung was 0.3 cm and 24th ring was 0.7 cm. If the radius of curvature of lens is 100 cm, then find the wavelength of light.

(c) Answer in details : (answer any one)   **3**

    (1) Discuss the Huygens's principle of wave front.

    (2) Newton's rings are observed in reflected light of wavelength 5.8×10^{-7} m. The diameter of 12th dark ring is 0.56 cm. Find the radius of curvature of the lens and thickness of the air film.

(d) Write a note on : (answer any one)   **5**

    (1) What is Fresnel's Baptism ? Explain its experimental arrangement.

    (2) Explain the experimental arrangement and formation of Newton's ring.

4 (a) Give the correct answers of following questions: **4**

    (1) Write the types of diffractions.

    (2) Write the formula for focal length of the zone plate.

    (3) The area of second half period zone is equal to _____ .

    (4) In Fraunhofer diffraction the centre of diffraction pattern is always bright (True/False)

(b) Answer the following : (answer any one)   **3**

    (1) What is the radius of the first zone of a zone plate of focal length 0.25m for a light of wavelength 5100 A°.

    (2) Find the focal length of zone plate having the first radius 0.5 mm and wavelength of light used is 5000 A°.

(c) Answer in detail : (answer any one)   **4**

    (1) Comparison between zone plate with convex lens.

    (2) Describe the construction of zone plate.

(d) Write a note on : (answer any one)   **5**

    (1) Discuss the Fraunhofer diffraction due to a single slit and its condition for production of maxima and minima.

    (2) Explain the theory of plate diffraction grating and it's condition.

5 (a) Give the correct answers of following questions :   **4**

    (1) State Fermat's principle of least time.

    (2) Write the formula for dispersive power of prism.

    (3) Angle of deviation is minimum _____ colour.

    (4) The unite of dispersive power _____ .

(b) Answer the following : (answer any one) **2**
    (1) When the angle of incident is equal to 60° on liquid surface the reflected beams was found to be completely plane polarized. Calculate the refractive index of the liquid.
    (2) Find the angular dispersion produced by a prism form the data : A=12 μ_V= 1.681 and μ_R= 1.591.

(c) Answer in detail : (answer any one) **3**
    (1) Describe the construction of a Nicol prism.
    (2) Find the polarizing angle for light incident from (1) air to glass (2) glass to water (3) water to glass [Given : μ_{glass} = 1.58, μ_{water}= 1.37]

(d) Write a note on : (answer any one) **5**
    (1) Discuss Fermat's principle and prove laws of reflection.
    (2) Define cardinal points of a lens system.

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