DY-2 Seat No. _____

B. Sc. (Sem. II) (CBCS) (W.E.F. 2019) Examination

April – 2022

Physics - 201

(Wave, Optics & Semi-Devices) (New Course)

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions :

(1) Answer any **five** questions.

(2) Figures on **right** side indicate marks.

1 (a) Answer the following questions : **4**

(1) Define mechanical waves.

(2) Light waves are non-mechanical. (True / False)

(3) Define longitudinal wave.

(4) What is wave number ?

(b) Answer the following questions : **2**

The displacement of particle of a string carring travelling wave is given by $y = 3\sin 2\pi\left(0.50x - 50t\right)$ where x in centimeter. Find the (a) Amplitude (b) wave length.

(c) Answer the following question : **3**

Write a short note on standing waves.

(d) Explain normal mode of vibration. **5**

2 (a) Answer the following questions : **4**

(1) Write the formula of velocity of sound in medium.

(2) Sound waves are mechanical wave. (True / False)

(3) Define intensity of sound wave.

(4) What are beats ?

(b) Answer the following questions : **2**

Calculate the velocity of sound in water volume elasticity of water $2.2 \times 10^9\ N/m^2$ $\sum = 1000\ kg/m^3$.

(c) Explain Newton's formula for speed of sound in gas. **3**

(d) Explain Doppler effect for stationary object and moving source **5**

3 (a) Answer the following questions : **4**

(1) Draw the symbol of P-N junction diode.

(2) What is rectifier ?

(3) What is filter circuit ?

(4) What is zener effect ?

(b) A half wave rectifier is used to supply 60 V dc to 9 resistive load of 800 Ω. The diode has a resistance of 25 Ω. Calculate a.c. voltage required. **2**

(c) Explain half wave rectifier with circuit diagram and derive an efficiency. **3**

(d) Give exploitations on zener diode and explain application of zener diode as voltage regulator. **5**

4 (a) Answer the following questions : **4**

(1) Give the full name of BJT.

(2) Draw the symbol of N-P-N transistor.

(3) The emitter region of transistor is heavily doped. (True / False)

(4) The ratio of collector current (I_C) to the emitter current (I_E) is called _____.

(b) In CB configuration $\alpha = 0.9$ and emitter current is 1 mA determine the value of base current. **2**

(c) Explain working of N-P-N transistor. **3**

(d) Explain CE connection in N-P-N transistor and derive the relation between α and β. **5**

5 (a) Answer the following questions : **4**

(1) Define wave front.

(2) Define interference.

(3) When wave are said to be coherent ?

(4) The central region in Newton's ring is _____.

(b) A beam of monochromatic light having wavelength 5890×10^{-8} cm is incident of thin glass plate. The angle of refraction is 60^{o} and refractive index $\mu = 1.5$, calculate the thickness of glass plate. **2**

(c) Discuss Young's double slit experiment. **3**

(d) Explain the experimental set-up of Newton's ring. **5**

6 (a) Answer the following questions : **4**

(1) Soap bubbles looks coloured due to _____.

(2) In young experiment, if the distance between the slit is decreased fring width will _____.

(3) The interference phenomenon can take place in all waves. (True / False)

(4) The Newton's ring produce due to Phenomention of _____.

(b) In Lloyd's single mirror experiment, the slit source is at a distance of 2 mm from the plane of the mirror the screen is kept at a distance of 1.5 m from the source. If wave length is 5890^{o}A, find the tring width. **2**

(c) Write a note on Lloyd's single mirror. **3**

(d) In case of plane parallel thin film discuss the interference due to reflected light. **5**

7 (a) Answer the following questions : **4**

(1) What is diffraction ?

(2) What is the condition of Fresnel diffraction ?

(3) Define zone plate.

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

(b) In the zone plate of focal length 20 cm find the radius of second zone ? $\lambda = 5000\, A^{\circ}$. **2**

(c) Discuss the Franhofer diffraction _____. **3**

(d) Discuss the theory and action of zone plate. **5**

8 (a) Answer the following questions : **4**

(1) The ray incident on the obstacle are parallel in _____ diffraction.

(2) Define transmitting grating ?

(3) Write the formula for radius of 3^{rd} half period zone.

(4) A° is the unit of wave length. (True / False)

(b) In Fraunhoffer diffraction pattern due to narrow slit a screen is placed 2m away from the lens to obtain the pattern. If the slit width is 0.2mm and the first minima lie 5mm on either side of the central maximum then find the wavelength of light. **2**

(c) Give comparision between zone plate and convex lens. **3**

(d) Discuss on Fresnet's explanation of the rectiliner propagation of light and prove that area of each half peride zone is $\pi b \lambda$. **5**

9 (a) Answer the following questions : **4**

(1) Define polarised light.

(2) State Brewster's law.

(3) Quartz is positive uniaxial crystal. (True / False)

(4) Angle of deviation is minimum for _____ colour.

(b) A ray of light is incident on the surface of glass plate of refractive index 1.55 at the polarizing angle. Calculate the angle of refraction. ($\tan^{-1}1.55 = 57°11'$) **2**

(c) State and explain Malus law. **3**

(d) Write a note on Nicol prism. **5**

10 (a) Answer the following questions : **4**

(1) Dispersive power of prism depend upon nature of material. (True / False)

(2) The unit of dispersive power is $A°$. (True / False)

(3) A Nicol prism is _____ crystal.

(4) White light is composed of _____ colors.

(b) A beam of light is passed through two nicols in series. In a particular setting maximum light is passed by the system and it is 500 units. If one of the Nicol are now rotated by $20°$ calculate the intensity of transmitted light $(\cos 20° = 0.9397)$. **2**

(c) Explain dispersive power of prism. **3**

(d) Explain dispersion by a prism. **5**
