B.Sc. PHYSICS
SECOND SEMESTER
WAVES & OPTICS
BSP – 202 [REPEAT]
[USE OMR FOR OBJECTIVE PART]

SET
A

Duration : 3 hrs.

Full Marks : 70

[__Objective__]

Time : 20 min.

Marks : 20

Choose the correct answer from the following: $1 \times 20 = 20$

1. what is propagated in a wave motion?
   a. Energy
   b. Momentum
   c. Both energy and momentum
   d. None

2. Resonance occurs at which type of vibration?
   a. Undamped vibration
   b. Damped vibration
   c. Forced vibration
   d. None

3. The resultant of two SHM's of equal time periods ,amplitudes, acting at right angles will be circular when the phase difference is
   a. $\dfrac{\pi}{4}$
   b. $\dfrac{\pi}{2}$
   c. $\dfrac{\pi}{6}$
   d. π

4. In which type of diffraction lenses are used?
   a. Fresnel diffraction
   b. Fraunhofer diffraction
   c. Both Fresnel and Fraunhofer diffractions
   d. None

5. An example if transverse wave is
   a. Sound wave
   b. Light wave
   c. Both sound and light waves
   d. None

6. The areas of Fresnels half period zones are
   a. Increases gradually
   b. Decreases gradually
   c. Remains equal
   d. None.

7. The velocity of sound in a medium depends on
   a. Only pressure
   b. Only temperature
   c. Only Density
   d. All

8. The frequency of oscillation in case of damped oscillation
   a. Greater than undameped oscillation
   b. Lesser than undamped oscillation
   c. Equal to the Undamped oscillation
   d. None

9. In which type of oscillations the amplitude of swing is constant?
   a. Forced oscillations
   b. Free oscillations
   c. Damped oscillations
   d. None

10. The average kinetic energy per unit volume of a progressive wave is ("a" is amplitude, ρ is the density and n is the frequency)

a.	$E = \pi^2 \rho n^2 a^2$	b.	$E = 2\pi^2 \rho n^2 a^2$
c.	$E = 3\pi^2 \rho n^2 a^2$	d.	None

11. Which principle states that travelling between two points will follow route with smallest optical path length?
   a. Newton's principle
   b. Fermat's principle
   c. Mate's principle
   d. Gauss' principle

12. Which of the following expressions correctly represents optical separation, Δ?
   a. $d-(f_1+f_2)$
   b. $f_1-(d+f_2)$
   c. $f_2-(d+f_1)$
   d. $d+f_1+f_2$

13. The modification of distribution of light energy due to superposition is called
   a. Refraction
   b. Polarization
   c. Interference
   d. Diffraction

14. What is the maximum intensity of superposition when two light waves have same amplitude, a?
   a. a^2
   b. $2a^2$
   c. $3a^2$
   d. $4a^2$

15. On reflection from a denser medium, the path difference introduced is,
   a. 2λ
   b. λ
   c. $\lambda/2$
   d. $\lambda/4$

16. For interference in thin films, what is the path difference between two reflected rays?
   a. $2\mu\mu \cos r$
   b. $2\mu\mu \sin r$
   c. $2\mu\mu \tan r$
   d. $2\mu \sin r$

17. What is the nature of fringes produced in Michelson's interferometer?
   a. elliptical
   b. circular
   c. square
   d. rectangular

18. What are the wavelengths of two components of D-lines of sodium?
   a. 5690 A, 5696 A
   b. 5790 A, 5796 A
   c. 5890 A, 5896 A
   d. 5990 A, 5996 A

19. What is the angle of polarization for glass?
   a. 53.5^0
   b. 54.5^0
   c. 56.5^0
   d. 57.5^0

20. What is the relation between refractive index μ and angle of polarization i?
   a. $\mu = \tan i$
   b. $i = \tan \mu$
   c. $\mu = \sin i$
   d. $i = \sin \mu$

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(Descriptive)

Time : 2 hrs. 40 min.   Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. Find the resultant of two simple harmonic motions of equal time   **10**
    periods when they act at right angles to each other. Discuss
    different important cases analytically.

2. a. Find the frequency of undamped free-vibrations.   **5+5=10**

    b. Considering closed end organ pipe show that the frequencies
       are in ratio 1 : 3 : 5: ....

3. a. Derive the relation $\frac{d^2y}{dt^2} = v^2 \frac{d^2y}{dx^2}$ **4+6=10**

    b. A simple harmonic is represented by the equation $y =$
       $10 \sin \left(10t - \frac{\pi}{6} \right)$ where y is in metres, t is in seconds and phase
       angle is in radians
    Calculate (i) the frequency (ii) the maximum displacements (iii)
    the time period.

4. a. What do you mean by zone plate? Show that the radii of half   **6+4=10**
       period zones are in the ratio $\sqrt{1} : \sqrt{2} : \sqrt{3} : \sqrt{4}$ …. etc.

    b. Differentiate Fresnel and Fraunhofer types of diffraction.

5. a. Use Fermat's principle to establish the law of reflection.   **5+5=10**

    b. Discuss spherical aberration with a proper diagram.

6. a. Describe achromatism and find the condition for achromatism   **6+4=10**
       for two thin lenses in contact.

    b. Discuss various forms of distortion.

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7. a. Describe the experimental arrangement to produce Newton's rings.   5+5=10

   b. In Newton's ring experiment, the radii of 10th and 20th rings are 0.2 and 0.3 cm respectively and the focal length of the plano- convex lens is 90 cm. Calculate the wavelength of light used.

8. a. Derive Brewster's law. Discuss double refraction with a figure.   3+3+4 =10

   b. How will you obtain elliptically and circularly polarized light?

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[4]