TEST SERIES 2019-20 **TEST NO. 1**

OPTICS **CONDUCTED ON 15TH DECEMBER 2019**

Maximum Marks: 55 **Time Allowed: 2 hours**

- **Section A is of 1 mark questions. Question 1 to 6 are multiple choice questions. Question 7 to 10 are fill in the blank questions. Question 11 to 16 are true or false questions. Question 17 and 18 are match the column type questions.**
- **Section B consist of 10 questions of 2 marks each.**
- **Section C consists of 5 questions of 3 marks each**

SECTION A

1. **An object is placed at a distance of 0.5 m in front of a plane mirror. The distance between object and image will be**
   a. **0.25 m**
   b. **0.5 m**
   c. **1.0 m**
   d. **2.0 m**
2. **Air bubble in water behaves as**
   a. **Sometimes concave, sometimes convex lens**
   b. **Concave lens**
   c. **Convex lens**
   d. **none of the above**
3. **in optical fibre, the refractive index of the core is**
   a. **greater than that of the cladding**
   b. **equal to that of the cladding**
   c. **smaller than that of the cladding**
   d. **no relation with that of the cladding**
4. **in case of a linearly polarized lioght, the magnitude of the electric field vector**
   a. **is parallel to direction of propagation**
   b. **does not change with time**
   c. **increase and decrease linearly with time**
   d. **varies periodically with time**

5. **Ratio of intensities of two waves is 9:1. If these waves are superimposed, what is the ratio of maximum and minimum intensities?**
   a. **9:1**
   b. **3:1**
   c. **4:1**
   d. **5:3**
6. **A diver at a depth 12 m inside water (μ=4/3) sees the sky in a cone of semivertical ang;e**
   a. $\sin^{-1} 4/3$
   b. $\tan^{-1} 4/3$
   c. $\sin^{-1} 3/4$
   d. 90^{o}
7. **The vertical plane passing through the principal focus and perpendicular to the principal axis is called……..**
8. **Blue colour of sky is due to phenomenon of ……..of sunlight**
9. **Width of dark and bright fringes in interference of waves is ……..**
10. **A continuous locus of particle of medium vibrating in the same phase at any instant is known as…….**
11. **The frequency changes when light passes from a rarer to a denser medium. (T/F)**
12. **For TIR to occur, critical angle must be greater than angle of incidence. (T/F)**
13. **Dispersion of light is the phenomenon behind the working of an optical fibre. (T/F)**
14. **Diffraction of light occurs when size of aperture is comparable to the wavelength of light. (T/F)**
15. **In single slit experiment, if the slit width is doubled than the original width, the intensity of central maxima increases to 4 times the initial intensity. (T/F)**
16. **The intensity in sunglasses and window panes can be controlled by polaroids. (T/F)**
17.

COLUMN 1	COLUMN 2
A. In YDSE apparatus is immersed in a liquid	(i) Fringe width will increase
B. When wavelength of light used is increased	(ii) Fringe width will decrease
	(iii) Fringe width will remain constant

18.

COLUMN 1	COLUMN 2
A. Colour scattered least in elastic scattering	(i) Red
B. Colour deviated most through prism	(ii) Violet
	(iii) yellow

19. **Does the value of polarizing angle depend on the colour of light?**

20. Which nature of light is provided by polarization and explain why sound wave cannot be polarized?

SECTION B

21. (a)The refractive index of glass is 1.5. What is the speed of light in glass? (Speed of light in vacuum is 3.0×10^8 m s^{-1}) (b) which of the two colours red and violet travels slower in a glass prism?
22. In YDS experiment, the two slits 0.15mm apart are illuminated by monochromatic light of wavelength 450nm. The Screen is 1.0m away from the slits.
    i. Find the distance of the Second bright fringe from the central maximum.
    ii. Find the distance of the Second dark fringe from the central maximum.
23. A beam of light consisting of two wavelengths 400nm and 500nm, is used to obtain interference of fringes in a young's double slit experiment. Find the least distance from the central maximum where the bright fringes due to both wavelengths coincide. The distance between the two slits is 0.28mm and the screen is at a distance of 1.4m from the slits.
24. In Young's double-slit experiment using monochromatic light of wavelength λ, the intensity of light at a point on the screen where path difference is λ/3 , is K units. What is the intensity of light at a point where path difference is λ /6?
25. What should be the width of each slit to obtain 20 maxima of the double slit pattern within the central maxima of the slingle slit pattern for light of wavelength 500 nm, if the separation between two slits is 1 mm?
26. Use the mirror equation to prove that an object placed between f and 2f of a concave mirror produces a real image beyond 2f.
27. A tank is filled with water to a height of 12.5 cm. The apparent depth of a needle lying at the bottom of the tank is measured by a microscope to be 10 cm. What is the refractive index of water? If water is replaced by a liquid of refractive index 1.75 up to the same height, by what distance would the microscope have to be moved to focus on the needle again?
28. The radii of curvature of the faces of a double concave lens are 10 cm and 15 cm. If focal length of the lens is 12 cm, find the refractive index of the material of the lens.
29. A converging lens has a focal length of 25cm in air. It is made of a material of refractive index 3/2. If it is immersed in a liquid of refractive index 4/3 , what will be its new focal length?
30. A beam of light converges at a point P. Now a lens is placed in the path of the convergent beam 12 cm from P. At what point does the beam converge if the lens is a convex lens of focal length 20 cm?

SECTION C

31. Draw a ray diagram to Show the refraction of a monochromatic light passing through a glass prism. Deduce the expression for the refractive index of glass in terms of angle of prism and angle of minimum deviation.
32. Trace the rays of light showing the formation of an image due to a point object placed on the axis of a spherical refracting surface separating the two media of refractive index n_1 and n_2. Establish the relation between the distance of the object, the image and the radius of curvature?
33. Define power of a lens. Derive an expression for the power of a combination of thin lenses in contact.
34. In YDS experiment derive the expressions to find the position of bright and dark fringes. Hence derive the expression for fringe width.
35. State briefly three features which can distinguish the characteristics features of an interference pattern from those observed in the diffraction pattern.

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