MULTIPLE CHOICE QUESTIONS

ENGINEERING PHYSICS - UNIT 3
Polarisation

1. Which of the following phenomena suggest that light may be a transverse wave?
   A. Reflection
   B. Polarisation
   C. Photoelectric effect
   D. Diffraction

2. In optics, when the vibrations of light are limited to a single two dimensional plane, it is said that light has been what?
   A. Polarised
   B. Plane polarised
   C. Partially polarised
   D. Unpolarised

3. Brewster's law in terms of refractive index can be expressed as
   A. μ = sin₂θ
   B. μ = cosθ
   C. μ = tanθ
   D. μ = cotθ

4. According to the law of Malus, the intensity of polarised light emerging through the analyzer varies as
   A. I₀Cos²θ
   B. I₀ Sin²θ
   C. I₀Cosθ
   D. I₀/2 Cos²θ

5. Which one is the example of uniaxial crystal?
   A. Calcite
   B. Tourmaline
   C. Quartz
   D. all of them

6. What happen if the ordinary unpolarised light is passed through a Uniaxial crystal
   A. light is split into two rays
   B. Light remain unaffected
C. light is split into more than two rays  
D. None of them  

7. Zone plate has some similarities as well as some differences with a  
A. Plano convex lens  
B. Concave lens  
C. grating  
D. Convex lens  

8. What happen to O and E rays if they travel along the optic axis?  
A. Both ray travel with the same velocity  
B. O ray travels faster than E ray  
C. E ray travel faster than O ray  
D. none of these  

9. How many principle sections of uniaxial crystal have?  
A. 6  
B. 3  
C. 5  
D. 2  

10. How much phase change is introduced by a quarter wave plate between ordinary and extra ordinary ray.  
A. $\pi$  
B. $2\pi$  
C. $\pi/2$  
D. $\pi/4$  

11. Dextrorotatory optically active substance rotates the plane of vibration?  
A. In clockwise direction  
B. In anticlockwise direction  
C. By 180 degree  
D. none of these  

12. Electric field vector vibrates in only one plane and perpendicular to the direction of propagation in .............light  
A. plane polarised  
B. unpolarised  
C. both plane polarised & unpolarised  
D. neither plane polarised & nor unpolarised  

13. The plane in which the electric field vector of plane polarised light vibrates is known as  
A. Plane of vibration  
B. Plane of Polarisation  
C. principal Plane  
D. None of above
14. The plane in which the magnetic field vector of plane polarised light vibrates is known as
   A. Plane of vibration       B. Plane of Polarisation
   C. Principal Plane         D. None of above

15. Plane of vibration is defined only for
   A. A. plane polarised       B. unpolarised
   C. both plane polarised & unpolarised
   D. neither plane polarised & nor unpolarised

16. If the angle between the axis of Polarizer and analyser is $30^0$, the intensity of light transmitted by analyser is..............times the intensity transmitted by the polarizer
   A. $\frac{1}{2}$          B. $\frac{3}{4}$          C. $\frac{1}{4}$          D. Zero

17. If the angle between the axis of Polarizer and analyser is $45^0$, the intensity of light transmitted by analyser is..............times the intensity transmitted by the polarizer
   A. $\frac{1}{2}$          B. $\frac{3}{4}$          C. $\frac{1}{4}$          D. Zero

18. If the angle between the axis of Polarizer and analyser is $90^0$, the intensity of light transmitted by analyser is..............times the intensity transmitted by the polarizer
   A. $\frac{1}{2}$          B. $\frac{3}{4}$          C. $\frac{1}{4}$          D. Zero

19. If the light is made incident on any transparent medium at the polarizing angle, the reflected light is,
   A. unpolarised          B. Plane polarised
   C. partially Polarised  D. none of these

20. If the light is made incident on any transparent medium at the polarizing angle, the transmitted light is,
   A. unpolarised          B. Plane polarised
   C. partially Polarised  D. none of these
21. The waves forming ordinary image are………..
   A. plane polarised B. unpolarised
   C. partially polarised D. any of above

22. Optic axis is ……………
   A. an imaginary line inside the crystal
   B. a real line inside the crystal
   C. a real direction inside the crystal
   D. none of these

23. Principle planes in calcite crystals are……………
   A. squares B. rhombus
   C. triangles D. parallelograms

24. The acute angle between the planes of crystal is…………
   A. $78^0$ B. $71^0$
   C. $102^0$ D. $109^0$

25. The obtuse angle between the planes of crystal is…………
   A. $78^0$ B. $71^0$
   C. $102^0$ D. $109^0$

26. The shape of O-wave front is--------------
   A. plane B. spherical C. elliptical D. cylindrical

27. The shape of E-wave front is--------------
   A. plane B. spherical C. elliptical D. cylindrical

28. The property of rotating the plane of vibration of plane polarized light is known as---------
   A. double refraction B. optical activity C. polarization D. Dichroism

29. The Specific rotation is…………
   A. independent of wavelength
   B. directly proportional to wavelength
   C. inversely proportional to wavelength
   D. inversely proportional to square wavelength

30. The thickness of crystal in an LCD is chosen so that it rotates the plane of vibration of plane polarized light by
   A. $45^0$ B. $90^0$ C. $30^0$ D. $60^0$
31. A quarter of a wavelength is equal to how many degrees of phase?
   A. 90
   B. 45
   C. 60
   D. 180

32. When a beam of ordinary white light is passed through a Polaroid plate filter, the intensity of the beam that emerges is:
   A. Equal to that of the incident beam
   B. About 0.9 that of the incident beam
   C. About one-half that of the incident beam
   D. Practically zero

33. Which is the following used to convert unpolarised light into polarised light
   A. Nicol Prism
   B. Calcite prism
   C. Tourmaline crystal
   D. None of the above

34. In double refraction, the vibrations of E ray are confined in
   A. Plane perpendicular to the principle section
   B. Principle section
   C. at an angle θ to the principle section
   D. keeps on changing orientation

35. If $V_e$ the velocity of E-ray and $V_o$ is the velocity of O ray in a negative crystal they are related by
   A. $V_o > V_e$
   B. $V_o < V_e$
   C. $V_o = V_e$
   D. None of these

36. A dichroic crystal converts UPL to PPL
   A. reflection
   B. Double refraction
   C. refraction
   D. selective absorption

37. The Nicol prism based on the action of
   A. reflection
   B. Double refraction
   C. refraction
   D. scattering

38. A L.C.D. is a device which is uses the phenomenon of
   A. optical activity
   B. refraction
   C. scattering
   D. dispersion
39. A half wave plate is used to add a phase difference of \( \frac{\pi}{2} \) to the O ray and E ray.
   A. \( \frac{\pi}{2} \)  
   B. \( \pi \)  
   C. 0  
   D. \( 2\pi \)

40. An optically active material
   A. changes the direction of propagation of light
   B. changes the direction of reflected light
   C. changes the direction of reflected light
   D. changes the direction of the plane of polarization

41. Laser radiation is:
   A. Monochromatic
   B. Directed in a narrow beam
   C. Produced with large power densities
   D. All of the above

42. A YAG laser has a frequency of \( 2.8 \times 10^{14} \) Hz. What is the wavelength of the light it produces?
   A. \( 1.2 \times 10^{-23} \) m
   B. \( 1.1 \times 10^{-6} \) m
   C. \( 1.2 \times 10^{-2} \) m
   D. \( 9.4 \times 10^{5} \) m

43. What is the wavelength of red light emitted by a helium-neon laser?
   A. 122 nanometers
   B. 633 nanometers
   C. 2.43 nanometers
   D. 1.37 micrometers

44. What is the lifetime of electron in metastable state?
   A. \( 10^{-3} \) sec
   B. \( 10^{-5} \) sec
   C. \( 10^{-8} \) sec
   D. \( 10^{-7} \) sec

45. LASER is a short form of
   A. Light Amplification by Spontaneous Emission of Radiation.
   B. Light Amplification by Stimulated Emission of Radiation.
   D. Light Absorption by Spontaneous Emission of Radiation.
46. In the population inversion
   A. The number of electrons in higher energy state is more than ground state
   B. The number of electrons in lower energy state is more than higher energy state
   C. The number of electrons in lower energy state and higher energy state are same
   D. None of them

47. Laser beam is made a of
   A. Electrons
   B. Highly coherent photon
   C. Elastic particles
   D. Excited atoms

48. In ruby Laser which ions give rise to laser action
   A. Al₂O₃
   B. Cr³⁺
   C. Al³⁺
   D. O –

49. Which of the laser have high efficiency
   A. Ruby
   B. Semiconductor
   C. He- Ne
   D. Co₂

50. The method of population inversion to the laser action in He-Ne laser is
   A. molecule collision
   B. direction conversion
   C. electric discharge
   D. electron impact

51. Which of the laser have very low efficiency
   A. Ruby
   B. He- Ne
   C. Semiconductor
   D. Ammonia gas laser

52. Ruby laser produces the laser beam of wavelength
   A. 6943 Å
   B. 6328 Å
   C. 6320 Å
   D. 6940 Å

53. The material in which the population inversion is achieve is called as
   A. Active medium
   B. metastable state
   C. passive medium
   D. stable states
54. The Ruby laser is
   A. Continuous Laser       B. gas Laser
   C. semiconductor laser    D. **pulsed laser**

55. The method of achieving population inversion in Ruby Laser is
   A. **Optical pumping**       B. inelastic Scattering
   C. forward biasing          D. chemical reaction

56. The He – Ne laser is
   A. **Continuous Laser**     B. gas Laser
   C. semiconductor laser      D. **pulsed laser**

57. The method of achieving population inversion in He – Ne Laser is
   B. Optical pumping          A. **inelastic Scattering**
   C. forward biasing         D. chemical reaction

58. A semiconductor diode Laser is
   A. Four level               C. Three level
   B. **Two level**            D. one level

59. A He- Ne laser is a
   A. Four level               C. **Three level**
   B. Two level                D. One level

60. In a semiconductor laser, the doping concentration is so high that the Fermi level in N type diode lies
   A. Center of energy gap
   B. Top of valence band
   C. Bottom of conduction band
   D. **Inside the conduction band**

61. The coherence length of Laser light is
   A. 4000 Å       B. 8000 Å       C. **300 m**       D. 2 µm

62. An optical fiber cable acts as the principle of
   A. Double refraction        C. reflection
   B. Total external refraction D. **total internal reflection**

63. A hologram records ..........of light
   A. Intensity     C. frequency
B. **Intensity and phase**

D. **frequency and Phase**

64. If a hologram is illuminated by white light it will form
   
   A. **Colorful image**  
   B. **Single color image**  
   C. **will not form image**  
   D. red image in black and white

65. A beam of light is incident on a glass plate at an angle of incidence $60^\circ$. The reflected ray is polarised. What is the angle of refraction, if the angle of incidence is $45^\circ$.
   
   A. $60^\circ$  
   B. $30^\circ$  
   C. $\sin^{-1}(\frac{1}{\sqrt{2}})$  
   D. $\sin^{-1}(\frac{1}{3})$

66. The thickness of quarter Wave Plate made of quartz for wavelength 5000 A. $\mu_e = 1.553$ and $\mu_0 = 1.543$ is
   
   A. $250 \times 10^{-3}$ cm  
   B. $1.25 \times 10^{-3}$ cm  
   C. $3.75 \times 10^{-3}$ cm  
   D. $2.50 \times 10^{-3}$ cm

67. A polarizer and analyzer are oriented so that the amount of transmitted light is maximum. Through what angle should either be turned so that the intensity transmitted light is reduced to 0.25 time maximum intensity.
   
   A. $90^\circ$  
   B. $60^\circ$  
   C. $150^\circ$  
   D. $160^\circ$

68. A 20 cm long tube containing 48 c.c. of sugar rotates the plane of polarization by $11^\circ$. If the specific rotation of sugar is $66^\circ$, calculate the mass of sugar solution.
   
   A. 8 gm  
   B. **4 gm**  
   C. 16 gm  
   D. 10 gm

69. When the light is incident at the polarizing angle which of the following completely polarised
   
   A. **Reflected light**  
   B. Refracted light  
   C. both  
   D. neither reflected nor refracted

70. The property of rotating the plane of vibration of plane polarized light is known as
   
   A. **double refraction**  
   B. **optical activity**  
   C. polarization  
   D. dichroism

71. When light travels parallel to the optic axis………………
   
   A. double refraction is observed  
   **B. double refraction is not observed**  
   C. Path difference between O and E waves
D. Both B and C.

72. The phase difference introduced by a retardation plate between the O ray and E waves for the positive crystal is …………………………………
   A. (μₑ - μₒ) t  B. (μₒ - μₑ) t  C. \( \frac{2\pi}{\lambda} (μₑ - μₒ) t \)  D. \( \frac{2\pi}{\lambda} (μₒ - μₑ) t \)

73. The phase difference introduced by a retardation plate between the O ray and E waves for the negative crystal is …………………………………
   A. (μₑ - μₒ) t  B. (μₒ - μₑ) t  C. \( \frac{2\pi}{\lambda} (μₑ - μₒ) t \)  D. \( \frac{2\pi}{\lambda} (μₒ - μₑ) t \)

74. ……………waves travels with the same velocity in all directions
   A. O  B. E  C. O and E  D. Neither O nor E

75. ……………waves travels with the different velocity in different directions
   A. O  B. E  C. O and E  D. Neither O nor E

76. O and E waves travel with the same velocity …………………in the crystal
   A. parallel to the surface
   B. Perpendicular to the surface
   C. along optic axis
   D. none of the above

77. If the light is incident on a transparent material at the polarizing angle of 60°, the angle of refraction is …………………
   A. 45°  B. 60°  C. 30°  D. 90°