Enrollment No: 230305105232

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech Mid Semester Exam

Semester: 2 | **Date: (02/04/2024)**
Subject Code: 303192102 | **Time: (1hr: 30min)**
Subject Name: (Engineering Physics-II) | **Total Marks: 40**

Q.1 Objective Type Questions (Each of one mark) 10

1. The Einstein's photoelectric equation is $h\nu = X + h\nu_0$. Here X represents the _____. (h is Planck's constant, ν is the frequency of incident radiation, ν_0 is threshold frequency)
   (a) The velocity of ejected electrons
   (b) The kinetic energy of ejected electrons
   (c) The intensity of incident light
   (d) None of the above
2. The intensity of a Black body radiation is not uniform with wavelength.
   (a) False
   (b) True
   (c) Cannot be predicted
   (d) None of the above
3. When $\hat{H}$ operates on a $\psi(r)$, then the corresponding eigen value is _____. ($\hat{H}$ is Hamiltonian operator, ψ (r) is wave function)
   (a) Potential energy of the system
   (b) Kinetic energy of the system
   (c) Total energy of the system
   (d) None of the above
4. Einstein's Coefficient of stimulated emission gives_____.
   (a) Rate of stimulated emission
   (b) Probability of stimulated emission
   (c) Probability of upward transition
   (d) Rate of spontaneous emission
5. Laser light is,
   (a) Monochromatic
   (b) Unidirectional
   (c) Highly intense
   (d) All of above
6. Optical Fibres transmit the light beam using the principle of _____.
7. State Heisenberg's Uncertainty Principle.
8. De Broglie hypothesis says that a moving particle is associated with a wave, the wave is called _____. (matter wave/ electromagnetic wave)
9. The numerical aperture of an optical fibre is related to only _____. (Core diameter/ Core and cladding refractive indices)
10. The semiconductor diode laser is made of _____. (GaAs/ Si)

Q.2 Attempt any four (Short Questions) 12

1. Write any three applications of Laser.
2. What is quantum tunneling effect?
3. State conditions for lasing action.
4. Calculate the numerical aperture and acceptance angle of an optical fiber from the following data

   n_1(core) = 1.55, n_2(cladding) = 1.50
5. What is wave function? Explain physical significance of a wave function.

Q.3 Attempt any two questions

1. Explain Briefly: (i) Population Inversion (ii) Meta-stable States 08
2. Explain Compton Effect in brief.
3. Classify optical fibres based on the modes of propagation and refractive index.

Q.4 (A) Explain working of He-Ne Laser. 05

(B) Explain wave-particle duality. Derive de Broglie's formula for the wavelength of matter wave. 05

OR

(B) Explain construction of optical fibre with necessary diagram. 05