

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

First Semester

Computer Science and Engineering

(Common to Electronics and Communication Engineering, Information Technology & Mechanical and Automation Engineering)

20BSPH101 - ENGINEERING PHYSICS

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

| | <i>Marks</i> | <i>K- Level</i> | <i>CO</i> |
|---|--------------|---------------------|-----------|
| 1. The number of atoms per unit cell in FCC structure (a) 1 (b) 2 (c) 3 (d) 4 | 1 | K1 | CO1 |
| 2. The Miller indices of a plane cutting x, y, z axes at a, ∞, a/2 are (a) (1 0 2) (b) (1 0 1) (c) (1 1 2) (d) (0 1 2) | 1 | K2 | CO1 |
| 3. In a laser, population inversion means: (a) More atoms in higher energy state (b) Equal atoms in both states (c) All atoms in ground state (d) Resonance condition | 1 | K2 | CO2 |
| 4. The role of He in Carbon dioxide laser is (a) heat emitter (b) heat absorber (c) promoter (d) All the above | 1 | K1 | CO2 |
| 5. The modulus that relates shear stress and shear strain is: (a) Young's modulus (b) Bulk modulus (c) Rigidity modulus (d) Poisson's ratio | 1 | K2 | CO3 |
| 6. In a torsion pendulum, the time period depends on: (a) radius (b) torsional constant (c) both a and b (d) none | 1 | K1 | CO3 |
| 7. Optical fiber works on the phenomenon of (a) polarisation (b) diffraction (c) refraction (d) total internal reflection | 1 | K1 | CO4 |
| 8. The numerical aperture of a fiber determines: (a) Power output (b) Light-gathering ability (c) Refractive index (d) Signal strength | 1 | K2 | CO4 |
| 9. The energy of a photon is given by: (a) hv (b) hc/λ (c) both a and b (d) hc/p | 1 | K1 | CO5 |
| 10. The unit of thermal conductivity is: (a) W/m·K (b) J/kg·K (c) W/m (d) J/s | 1 | K1 | CO6 |

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

| | | | |
|--|---|----|-----|
| 11. Define unit cell. | 2 | K1 | CO1 |
| 12. What are Bravais lattices? | 2 | K1 | CO1 |
| 13. What are the necessary conditions for laser action? | 2 | K1 | CO2 |
| 14. Enumerate the different types of pumping. | 2 | K2 | CO2 |
| 15. Write the relation between Young's modulus, bulk modulus and rigidity modulus. | 2 | K2 | CO3 |
| 16. What is Poisson's ratio? | 2 | K1 | CO3 |
| 17. What are active and passive sensors? | 2 | K1 | CO4 |
| 18. Differentiate step index and graded index fibers. | 2 | K2 | CO4 |
| 19. Define Black body radiation. | 2 | K1 | CO5 |
| 20. Infer wave particle duality nature. | 2 | K2 | CO5 |
| 21. What is thermal conductivity? | 2 | K1 | CO6 |
| 22. Mention two applications of heat exchangers. | 2 | K1 | CO6 |

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23. a) Explain in detail the different crystal structures (SC, BCC, FCC) and derive the packing factor for FCC. 11 K2 CO1

OR

- b) Describe the Miller indices and derive the expression for interplanar spacing for cubic crystals. 11 K2 CO1

24. a) Derive the expression for the Einstein's A and B coefficients. 11 K2 CO2

OR

- b) Explain the working principle of a semiconductor laser with neat diagram. 11 K2 CO2

25. a) Derive an expression for the elevation at the centre of a beam which is loaded at both ends. 11 K2 CO3

OR

- b) Derive the expression of depression produced in the cantilever beam. 11 K2 CO3

26. a) Derive an expression for numerical aperture and acceptance angle in an optical fiber. 11 K2 CO4

OR

- b) Give an account on fiber optic pressure and displacement sensors. 11 K2 CO4

27. a) Explain Planck's hypothesis. Derive Planck's radiation law. 11 K2 CO5

OR

- b) Derive Schrödinger's time-independent and dependent wave equations. 11 K2 CO5

28. a) Explain the theory and experimental setup of Lee's disc method to determine thermal conductivity of a bad conductor. 11 K2 CO6

OR

- b) Describe how thermodynamic principles are applied in the refrigerator. 11 K2 CO6