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Question Paper Code:R2P03

B.E./B.Tech. DEGREE EXAMINATION, APRIL /MAY 2025

Second Semester

Civil Engineering

R21UPH203 - MATERIAL PHYSICS

(Regulations R2021)

(Common to Mech, Agri and Chemical Engineering branches)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. Repeatable entity of a crystal structure is known as CO1-U
(a) Lattice (b) Crystal (c) Unit cell (d) Basis
2. A particular metal has a simple cubic unit cell. How many atoms of the metal are in each unit cell? CO3-App
(a) 1 (b) 4 (c) 6 (d) 2
3. Spherical wave front is received CO2-U
(a) Near the lighting tube light (b) Near the sun
(c) When the light wave is coming from sun to earth (d) All of the above
4. Which of the following is the unique property of laser CO2-U
(a) Monochromatic (b) directionality (c) coherence (d) all of them
5. Which of the following is an application of thermodynamics? CO1-U
(a) Refrigerators (b) Gas compressor (c) Power plants (d) All of these
6. Example of reverse heat engine is _____ CO1-U
(a) heat pump (b) refrigerator
(c) both a and b (d) none of the mentioned
7. Sound waves with frequencies above 20 kHz are called CO2-U
(a) Ultrasonic (b) Supersonic (c) audible (d) None of these

8. A reverberation time of _____ is acceptable for speeches and lectures, while a reverberation time of 1 to 2 s is satisfactory for concerts. CO5-App
- (a) 0.6 s (b) 0.3 s (c) 0.9 s (d) None of these
9. The conductivity of a nanowire much less than that of the corresponding bulk material due to scattering from _____. CO1-U
- (a) grains (b) boundaries
- (c) both grains and boundaries (d) None of these
10. When does a shape memory alloy return to its original shape? CO1-U
- (a) At transition temperature (b) At Curie temperature
- (c) At memory transfer temperature (d) At normal temperature

PART – B (5 x 2= 10 Marks)

11. The lattice constant for a FCC structure is 4.938 Å. Calculate the interplanar spacing of (220) planes. CO1-U
12. Differentiate between Laser beam and ordinary light beam. CO2-U
13. State the first law for a closed system undergoing a change of state. CO1-U
14. What is meant by non-destructive testing? CO2-U
15. What is meant by glass transition temperature? CO1-U

PART – C (5 x 16= 80 Marks)

16. (a) Draw and explain the seven crystal system on the basis of lattice parameters. CO1-U (16)
- Or
- (b) Explain the HCP structure and show that the packing factor of the HCP is 0.74. CO1-U (16)
17. (a) Explain the construction and working of molecular gas laser using energy level diagram. CO2-U (16)
- Or
- (b) Determine the thickness of the wire using the air-wedge method. CO2-U (16)
18. (a) Derive the efficiency of a Carnot engine in terms of source and sink temperatures. CO1-U (16)
- Or
- (b) Obtain and explain the expression of the Seebeck effect, Peltier effect and Thomson effect. CO1-U (16)

19. (a) Using Sabine's formula, how the sound absorption coefficient of a material is determined. **CO5-App (16)**

Or

- (b) A carpet is to be used to cover the floor in a music hall for absorption of sound. Determine absorption coefficient of the carpet using Sabine's formula. **CO5-App (16)**

20. (a) Explain briefly the main features of shape memory alloys. Write the applications of shape memory alloys (SMAs). **CO1-U (16)**

Or

- (b) Describe carbon nanotubes (CNT) and explain their properties and applications of the CNT. **CO1-U (16)**

