JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- APRIL-2023

COURSE CODE(CREDITS): 18B11WPH731 (3) MAX. MARKS:25

COURSE NAME: NANOTECHNOLOGY

COURSE INSTRUCTORS: DR. RAGINI RAJ SINGH MAX. TIME: 1 Hour 30 Minutes

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Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q.1. Regarding magnetic materials, discuss magnetic induction, permeability and hysteresis curve along with the types of magnetic materials. [CO: 2; Marks: **4**]

Q.2. Differentiate between ferromagnetic and superparamagnetic materials. What are the unique features and types of magnetic nanoparticles? [CO: 2 ; Marks: **4**]

Q.3. What do you understand by Surface plasmon resonance in metallic nanoparticles? Discuss the application of surface plasmon resonance for sensors [CO: 3; Marks: **4**]

Q.4. Derive the formula to calculate the density of states in quantum dots and discuss different types of quantum structures with the help of diagrams. [CO: 3; Marks: **4**]

Q.5. Calculate the number of states per unit of energy in a 200 by 200 nm by 2 nm piece of silicon ($m^*=1.08\ m_o$) 100 meV above the conduction band edge. Write the result in units of eV^{-1}. [CO: 3; Marks: **3**]

Q.6. How quantum mechanics is helpful to explain the quantum dots and what are the main observations from the particle in a finite well problem of quantum mechanics? [CO: 4; Marks: **3**]

Q.7. Explain magnetic nanoparticles in view of their properties. Give some examples of different types of magnetic nanoparticles. [CO: 4; Marks: **3**]