



MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL
(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER BTECH. (E & C) DEGREE POE(MAKEUP) – FEBRUARY 2022

SUBJECT: Nanotechnology (ECE - 4079)

TIME: 75 minutes

MAX. MARKS: 20

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

Q. No.	Questions	M*
1A.	Calculate number of Ga and As Atoms per cubic centimetre in a GaAs crystal with lattice constant 5.65 Å. Calculate the inter energy level spacing given that Fermi energy of Ga As is 0.30 eV. Comment on the result.	4
1B.	Describe the phenomenon, with neat schematic, that determines the colour of metallic nano particles. Distinguishes the spherical and asymmetric nano particles.	3
1C.	How graphene oxide powder can be prepared in large quantities? Explain how substrate thermal conditions effect of formation of graphene in CVD techniques.	3
2A.	Calculate bulk exciton Bohr radius, electron and hole exciton Bohr radii of InP. Indicate the possible nano-dimensions for various regimes of quantum confinement. Given that $m_e = 0.07 m_o$, and $m_h = 0.4 m_o$ and $\epsilon = 14$.	3
2B.	Describe different scanning probe techniques to characterise the nanostructures surfaces for their electronic and morphological properties How they differ in their principles.	4
2C.	Describe with the aid of band diagrams how the density of states can be estimated for a given nanostructure. Indicate the experimental technique that can be used for this purpose.	3