



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 |
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| 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 |
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