UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2020

DSE1-PHYSICS

ASSIGNMENT

The figures in the margin indicate full marks.
All symbols are of usual significance.

The question paper contains paper DSE-1A, DSE-1B and DSE-1C
The candidates are required to answer any *one* from *three* courses.
Candidates should mention it clearly on the Answer Book.

For each question, the candidates will be graded according to the quality of the presentation of the topic (8 marks) and originality of language (2 marks).
Maximum word limit of each topic is 400

DSE1A

NANO-MATERIALS AND APPLICATIONS

Full Marks: 40

Write short notes on any *four* (4) of the following topics   10×4 = 40

1.   1D, 2D and 3D nanostructures and size effect in nano-systems.

2.   Physical vapour deposition technique and its importance.

3.   Scanning electron microscopy and its importance in nanomaterials.

4.   Quasi-particles and excitons in nanostructured systems.

5.   Coulomb blockade effect and thermionic emission.

6.   Nanowires and its importance.

DSE1B

ADVANCED MATHEMATICAL PHYSICS-I

Full Marks: 40

Write short notes on any *four* (4) of the following topics   10×4 = 40

1.   Linear transformation algebra and its properties.

2.   Application of Laplace transform to second order differential equation: illustrate with example.

3.   Inverse Laplace transform and its properties.

4.   Invariant tensors: illustrate with the Kronecker delta tensor and the Levi-Civita (alternating) tensor.

5.   Contravariant and covariant tensors and their importance.

6.   Vector algebra using tensors.

DSE1C

CLASSICAL DYNAMICS

Full Marks: 60

Write short notes on any *six* (6) of the following topics $10 \times 6 = 60$

1.   Generalized coordinate, generalized force, and Hamiltonian of a system.

2.   Effective potential in central force problem.

3.   The invariant interval, world line, and light cone.

4.   Four momentum and four force in relativistic dynamics.

5.   Small oscillation of a linear triatomic molecule.

6.   Equilibrium and stability of a system: illustrate with an example.

7.   Laminar flow and stream lined motion of fluid.

8.   Conservation of four momentum and its implication.

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