UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2020

DSE2-PHYSICS

ASSIGNMENT

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

**The question paper contains paper DSE-2A, DSE-2B and DSE-2C
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**

DSE2A

NANO-MATERIALS AND APPLICATIONS

Full Marks: 40

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

1. Atomic force microscopy and its importance in nanomaterials.

2. Comparison between Top-down and Bottom-up process.

3. Sol-Gel method and its advantages.

4. X-Ray diffraction and its importance in nanoworld.

5. Coulomb interaction and dielectric constant in nanostructures.

6. Thin film and its importance in solar cell.

DSE2B

ADVANCED MATHEMATICAL PHYSICS-I

Full Marks: 40

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

1. Basis and change of basis in vector space.

2. Convolution theorem of Laplace transform.

3. Properties of Laplace transform.

4. The Quotient law in tensors: illustrate with examples.

5. Gradient and divergence of tensor fields.

6. Symmetric and antisymmetric tensors and their properties.

DSE2C
CLASSICAL DYNAMICS

Full Marks: 60

Write short notes on any *six* (6) of the following topics $10\times6 = 60$

1. Hamiltonian formulation of a 2D-harmonic oscillator.

2. The Laplace-Runge-Lenz vector and its properties.

3. Minkowski space and spacetime intervals.

4. Doppler effect from four-vector perspective and concept of four-force.

5. Normal modes and normal frequencies in the context of small oscillation.

6. Conservation of angular momentum and energy in central force.

7. Equation of continuity and conservation of mass in fluid dynamics.

8. Navier-Stokes equation and its application.

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