

M.Sc. S.Y. (Physics) (CBCS Pattern) Semester-IV
**PSCPHYT15.2 - Core Elective 2 - Paper-XV - Nanoscience and
Nanotechnology-II**

P. Pages : 2

Time : Three Hours



GUG/S/25/11416

Max. Marks : 80

Either:

1. a) Explain the fundamental principles of photonics and describe various photonic devices used in modern technology. **8**
- b) Discuss the working principles of different types of lasers. Compare their advantages and applications in nanophotonics. **8**

OR

- e) Explain the working and applications of phototherapy lamps. How do nanomaterials improve their performance? **8**
- f) What is optical stimulated luminescence? Explain its principle and applications in various fields. **8**

Either:

2. a) Explain the basics of ferromagnetism and the effect of nanostructuring on magnetic properties. **8**
- b) What are giant and colossal magnetoresistance effects? Explain their underlying mechanisms and applications. **8**

OR

- e) Discuss the applications of nanomagnetic materials in data storage. How do nanostructures enhance storage capacity and efficiency? **8**
- f) Explain the concept of superparamagnetism. How does the grain size of nanomagnets affect their magnetic behavior? **8**

Either:

3. a) Compare the top-down and bottom-up approaches in nanofabrication. What are the advantages and limitations of each? **8**
- b) Explain the structure and working of nanoscale MOSFETs. How do they differ from traditional MOSFETs? **8**

OR

- e) Explain the working principles and applications of Nanowire Field Effect Transistors (NWFETs). **8**

- f) What are carbon nanotube transistors? Explain their structure, working principles, and advantages over silicon-based transistors. **8**

Either:

4. a) Define nanocomposites and explain their classification based on material composition. **8**
- b) Discuss the properties and applications of metallic nanocomposites. How do they differ from polymer and ceramic nanocomposites? **8**

OR

- e) Describe the different preparation techniques used for synthesizing nanocomposites. How do they affect material properties? **8**
- f) Discuss the role of graphene, fullerenes, and carbon nanotubes (CNTs) in polymer nanocomposites. **8**

5. Attempt all of the followings-

- a) Describe the concept of luminescent solar concentrators. **4**
- b) What is spintronics? Discuss its potential applications in future electronic devices? **4**
- c) Discuss the role of nanotechnology in memory devices. How are nanomaterials used to enhance memory storage efficiency? **4**
- d) What are one-dimensional conducting polymer nanocomposites? **4**
Explain their synthesis and applications in electronics and energy storage.
