

**M. TECH. (NANO TECHNOLOGY) SEM-I (CBCS – 2015 COURSE) :**  
**WINTER - 2017**  
**SUBJECT: NANO PHYSICS**

Day: **Wednesday**  
Date: **17/01/2018**

Time: **11.00 AM TO 02.00 PM**

Max Marks: **60**

**W-2017-2747**

**N.B.:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answer to both the sections should be written in **SEPARATE** answer book.

**SECTION-I**

**Q1** What is Zeeman effect? Drive the formula for Zeeman shift. **(10)**

**OR**

Explain rotational and vibrational spectra in a diatomic molecule. **(10)**

**Q2** Give the physical interpretation and requirements of the wave function. **(10)**

**OR**

Calculate the following commutators, **(10)**  
[X, P<sub>X</sub>] and [L<sub>X</sub>, L<sub>Y</sub>]

**Q3** Derive the Bragg's law for crystal diffraction. How it can be used for understanding the crystal structures? **(10)**

**OR**

Explain the absorption and emission of photon in semiconductors with direct and indirect band gap. **(10)**

**SECTION-II**

**Q4** Explain the working of p-n junction diode on the basis of Fermi level. **(10)**

**OR**

What is filter? Write a short note on first order low pass active filters. **(10)**

**Q5** With energy level diagram, explain the working Ruby laser. Why it has pulsed output? **(10)**

**OR**

What is holography? Give the recording and reillumination of hologram. **(10)**

**Q6** What is Gauss's law? Derive the Gauss's law in differential and integral form. **(10)**

**OR**

Give the Maxwell's equation in differential form. Explain the meaning of each equation. **(10)**

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