Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov/Dec 2017**

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| **Code :** | **16NT3014** | **Duration :** | **3hrs** |
| **Sub. Name :** | **MOLECULAR MACHINES AND SENSORS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (2 × 20 = 40 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Draw the structure of porphyrin. Mention any one naturally occurring light harvesting antenna. | CO2 | 2 |
| b. | What are redox switches Give an example. | CO2 | 2 |
| c. | Write an example of molecular rotor and explain its operation. | CO3 | 2 |
| d. | Give a detailed account of the principles to be followed in designing molecular machines and mimicking nature. | CO2 | 14 |
| (OR) | | | | |
| 2. | a. | What is the role of STM in operating molecular machines? | CO1 | 2 |
| b. | Mention any two non-radiative emission phenomena. | CO2 | 2 |
| c. | Give an example of a molecular NOR logic gate. | CO1 | 2 |
| d. | Explain the structure of dendrimers. | CO1 | 8 |
|  | e. | What are the major differences between artificial and natural molecular machines? | CO3 | 6 |
| 3. | a. | Give an account of the energy involved in molecular machines. | CO2 | 5 |
| b. | What are meant by light–harvesting antennae and light harvesting complexes? Explain their working and applications. | CO2 | 15 |
| (OR) | | | | |
| 4. | a. | Why are molecules used in nanoscale machines? Explain a molecular on-off switch based on cyclization. | CO1 | 10 |
| b. | Explain overcrowded alkenes and molecular shuttles. | CO2 | 10 |
| 5. | a. | Mention any three of the salient features of Drexler–Smalley debate on molecular machines. |  | 5 |
| b. | With suitable illustration, explain a molecular tweezer. | CO4 | 5 |
| c. | Describe the involvement of cyclic oligosachcharides in forming rotaxanes. | CO4 | 10 |
| (OR) | | | | |
| 6. |  | Describe with suitable examples i. cucurbituril rotaxanes ii. fullerene wheeled nanocar iii. ethynyltripycene wheel barrows. | CO5 | 20 |
| 7. | a. | Explain with the aid of a neat diagram, the function of a two input molecular logic gate. | CO4 | 10 |
| b. | Explain allosteric effect involved in crown ether like compounds due to pure chemical inputs. | CO5 | 10 |
| (OR) | | | | |
| 8. | a. | Elaborate the action of rotary motion of molecules on surfaces. | CO4 | 10 |
| b. | Discuss the working of a molecular switch of an overcrowded alkene. | CO3 | 10 |
| 9. |  | **Compulsory:** | CO5 | 10 |
| a. | With the help of a suitable example explain the role of intramolecular charge transfer in metal ion sensing. |
| b. | How can the metal ion selectivity and selectivity of a molecular sensor be determined? | CO5 | 10 |

ALL THE BEST