BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING EXAMINATION, 2019

(4th Year, 2nd Semester)

INTRODUCTION TO NANO- BIO TECHNOLOGY

Time: Three Hours | Full Marks: 100

(50 marks for each part)

Use a **separate** Answer-script for each Part

PART-I

Answer ***any three*** questions

Two marks are reserved for neat and well organized answer script

1. a) Identify some important topics of research in nano-bio technology in the coming years. 6

   b) Describe a "respirocyte" and its proposed working principle. 5

   c) What is "bioengineered cell rover"? Explain its function. 5

2. a) What is nano scale? Give idea of a nano-bio structure that fits in a nano scale. 3

   b) Draw a schematic of various types of pharmaceutical nano systems. 5

   c) Write short notes on (i) Liposomes and (ii) Dendrimers. 8

3. Explain how a (i) rotary and a (ii) linear motion molecular bio-motor can be implemented. Draw neat sketches in support of your answer. 16

4. How photoinduced electron transport takes place in DNA? Compare with respect to HOMO-control and LUMO-control. 16

5. Explain the structure and photocycle of bacteriorhodopsin. Highlight the important amino acids that contribute to the light-driven photocycle. Show the key intermediates, along with each absorption maximum, of the primary (bR, K, L, M, N, and O) and branched (P and Q) photocycle. 16

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Ex/EE/T/424B/2019

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PART-II

Answer Question number 1 and any two from the rest

1. a) What is carbon nanotube? What do you understand by the terms SWCT and MWCT? 5

   b) Describe different structures of carbon nanotube. 6

   c) Briefly explain different fabrication processes of carbon nanotube. 9

2. State in brief following nano material characterization tools:

   a) Atomic Force Microscopy

   b) Fluorescence microscopy

   c) Electron microscopy 5+5+5

3. a) Describe different forces that play vital roles in creation of stable nanostructures. 9

   b) Discuss different properties of carbon nanotube 6

4. a) What is Moore's law? What are the factors enabling Moore's law? 6

   b) Explain Moore's Second Law. 6

   c) Briefly explain the development of nanoscale transistors 3

5. Write short notes on **any two** of the following: $2 \times 7.5 = 15$

a) Quantum Computing.

b) Operation of tunnel diode in viewpoint of nanotechnology.

c) Fullerene and Graphene.

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