

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) EXAMINATION, 2024

(5th 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

(2 marks for neat and well-organized answers)

1. a) Briefly explain the different forces that play vital role in creation of stable nanostructures. 10
b) Describe in brief different commercial application of nanotechnology. 6
2. a) Describe the different structures of nanotubes. 6
b) Explain the different fabrication processes of carbon nanotubes. 10
3. In brief, explain the following nano-material characterization tools: 16
 - a) Atomic Force Microscopy
 - b) Fluorescence Microscopy
 - c) Electron Microscopy
4. a) What is Moore's law? What are the factors enabling Moore's law? 2+4
b) Explain Moore's Second Law. 6
c) Briefly explain the development of nanoscale transistors. 4
5. Write short notes on any two of the following: 2×8=16
 - a) Dip Pen Nanolithography (DPN) and Self-Assembly Techniques for Manufacturing Nanostructures
 - b) Different properties of carbon nanotubes
 - c) Operation of tunnel diode in the context of nanotechnology

[Turn over

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PART-II

Answer *any three* questions

Two Marks are reserved for neatness and well organized answer script

1. With neat sketches, explain the operation of (i) linear motor myosin and (ii) rotary motor of flagella. 7+9

2. With proper illustrations, show the photo induced HOMO-control and LUMO-control in DNA. Draw and explain the electrode arrangements to evaluate Base mismatch. 10+6

3. a) Identify some important topics of research in coming years in biomedical nano-biotechnology. 6
b) Describe an "artificial red blood cell" and its proposed working principle. 5
c) What is a "microbivore"? Explain its working. 5

4. a) Classify nanomaterials with proper example related to nano-bio technology. 8
b) Write short notes on (ii) Dendrimers and (iii) Dendrites. 4+4

5. a) Explore the applications of nano-biotechnology within medical and clinical fields. 8
b) Mention some of the future prospects of nano-biotechnology? 4
c) Discuss the challenges faced by nano-biotechnology. 4