Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 1 EXAMINATION

Odd Semester: 2021 - 22

Course Code: MEC 3009

Course Name: Nanotechnology (DE 1)

Program & Sem: B. Tech & IV Sem

Date: 26th April 2022

Time: 03:00PM to 04:00PM

Max Marks: 30

Weightage: 15 %

Instructions:

(i) Read the all questions carefully and answer accordingly.

(ii) Scientific and non-programmable calculators are permitted

Part A [Memory Recall Questions]

Answer both the Questions. Each question carries FOUR marks (2Qx 4M= 08M)

1 The morpheme Nano is commonly defined simply as a prefix meaning "**billionth part of**", following SI; for example, nanometer means "billionth part of a meter". Mention the history of Nanomaterials being used unknowingly. (C.O.No.2) [Knowledge]

2. It is generally acknowledged that the term nanotechnology was first used by the late Professor **Norio Taniguchi** of the Tokyo Science University in a paper, "On the Basic Concept of 'Nanotechnology'", presented at a meeting of the Japan Society of Precision Engineering in 1974. Write the statement of Richard Feynman at the annual American Physical Society meeting at Caltech on December 29, 1959.
(C.O.No.1)[Knowledge]

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries SIX marks. (2Qx6M=12M)

3 Nanomaterials describe, in principle, materials of which a single unit small sized (in at least one dimension) **between 1 and 100 nm** (the usual definition of nanoscale). Mention the dimension of Nano materials representing its characteristics. (C.O.No.1) [Comprehension]

4 A nanometer (nm) is a unit of length that refers to one billionth of a meter. Nanotechnology is the technology that studies the properties and interactions of matter at the nanoscale (between 1 and 1000 nm) and uses these properties. In nanotechnology, nanomaterials are its main research object and foundation. With at least one example explain the function Nano structure in nature. (C.O.No.2) [Comprehension]

Part C [Problem Solving Questions]

Answer the Questions. Each question carries TEN marks. (1Qx10M=10M)

5 **Due to a much higher surface-to-volume ratio (and thus a larger specific surface area), nano-objects often show an increased reactivity**, since usually only the atoms or molecules located on the surface of the molecule react with the environment. Prove the statement. (C.O.No. 2) [Comprehension]

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TEST 2

Odd Semester: 2021 - 22
Course Code: MEC 3009
Course Name: Nanotechnology (DE 1)
Program & Sem: B. Tech & IV Sem

Date: 1st June 2022
Time: 03:00 PM to 04:00 PM
Max Marks: 30
Weightage: 15 %

Instructions:

(i) *Read the all questions carefully and answer accordingly.*

(ii) *Scientific and non-programmable calculators are permitted*

Part A [Memory Recall Questions]

Answer both the Questions. Each question carries FOUR marks. (2Qx 4M= 08M)

Q.NO.1 The morpheme Nano is commonly defined simply as a prefix meaning "**billionth part of**", following SI; for example, nanometer means "billionth part of a meter". Write briefly about Bottom-up process/Chemo physical process. (C.O.No.3) [Knowledge

Q.NO.2. It is generally acknowledged that the term nanotechnology was first used by the late Professor **Norio Taniguchi** of the Tokyo Science University in a paper, "On the Basic Concept of 'Nanotechnology'", presented at a meeting of the Japan Society of Precision Engineering in 1974. Write a brief note on why investigation techniques are used in Nanotechnology. (C.O.No.4) [Knowledge]

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries SIX marks. (2Qx6M=12M)

Q.NO.3 Nanomaterials describe, in principle, materials of which a single unit small sized (in at least one dimension) **between 1 and 100 nm** (the usual definition of nanoscale). Write a brief note on inert gas condensation process with the help of a schematic diagram. (C.O.No.3) [Comprehensive]

Q.NO.4 A nanometer (nm) is a unit of length that refers to one billionth of a meter. Nanotechnology is the technology that studies the properties and interactions of matter at the nanoscale (between 1 and 1000 nm) and uses these properties. In nanotechnology, nanomaterials are its main research object and foundation. Explain the phenomenon of precipitation process to produce Nano products.

(C.O.No.4) [Comprehensive]

Part C [Problem Solving Questions]

Answer the Question. The question carries TEN marks. (1Qx10M=10M)

Q.NO.5.Explain the working technique of Scanning electron microscope with a neat figure.

(C.O.No. 2) [Comprehensive]

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END TERM EXAMINATION

Winter Semester: 2021 - 22
Course Code: MEC 3009
Course Name: Nanotechnology (DE 1)
Program & Sem: B.Tech (MECH) & IV Sem

Date: 30th June 2022
Time: 9.30 AM to 12.30 PM
Max Marks: 100
Weightage: 50%

Instructions:

(i) Read all the questions carefully and answer accordingly.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries SIX marks. (5Qx6M= 30M)

Q.NO 1. Nanotechnology refers to the branch of science and engineering devoted to designing, producing, and using structures, devices, and systems by manipulating atoms and molecules at nanoscale. Brief the applications of Nanotechnology. (C.O.No.1) [Knowledge]

Q.NO 2. A nanofluid is a fluid in which nanometer-sized particles, suspended in the base fluid, form a colloidal solution of nanoparticles in a base fluid. Brief the working of Nanofluid in Mobile phones.

(C.O.No.2) [Knowledge]

Q.NO 3. Nanomaterials describe, in principle, materials of which a single unit is sized between 1 and 100 nm. Nanomaterials research takes a materials science-based approach to nanotechnology, leveraging advances in materials metrology and synthesis which have been developed in support of microfabrication research. Write a brief note on Inert gas condensation process.

(C.O.No.3) [Knowledge]

Q.NO 4. Nanomaterials are materials with at least one external dimension that measures 100 nanometers (nm) or less or with internal structures measuring 100 nm or less. The nanomaterials that have the same composition as known materials in bulk form may have different physico-chemical properties. Write the importance of scanning probe techniques. C.O.No.4) [Knowledge]

Q.NO 5. Nanomaterials are not simply another step in the miniaturization of materials or particles. They often require very different production approaches. There are several processes to create

various sizes of nanomaterials, classified as ‘top-down’ and ‘bottom-up’. Write a brief note on carbon based nano particles. (C.O.No.5) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks. (4Qx10M=40M)

Q.NO 6. Nanomanufacturing is both the production of nanoscaled materials, which can be powders or fluids, and the manufacturing of parts "bottom up" from nanoscaled. Gas phase process with a neat sketch. (C.O.No.5) [Comprehension]

Q.NO 7. Quantum dots are semiconductor particles a few nanometres in size, having optical and electronic properties that differ from larger particles due to quantum mechanics. They are a central topic in nanotechnology. Write a brief note on Quantum dots. (C.O.No.4) [Comprehension]

Q.NO 8. Graphene is a single layer (monolayer) of carbon atoms, tightly bound in a hexagonal honeycomb lattice. It is an allotrope of carbon in the form of a plane of sp2-bonded atoms with a molecular bond length of 0.142 nanometers. Write a brief note on Graphene and its production process. (C.O.No.3) [Comprehension]

Q.NO 9. A carbon nanotube is a tube made of carbon with diameters typically measured in nanometres. Single-wall carbon nanotubes Single-wall carbon nanotubes are one of the allotropes of carbon, intermediate between fullerene cages and flat graphene, with diameters in the range of a nanometre. Write a brief note on carbon nanotube. (C.O.No.2) [Comprehension]

Part C [Problem Solving Questions]

Answer both the Questions. Each question carries FIFTEEN marks. (2Qx15M=30M)

Q.NO 10. A nanofluid is a fluid containing nanometer-sized particles, called nanoparticles. These fluids are engineered colloidal suspensions of nanoparticles in a base fluid. The nanoparticles used in nanofluids are typically made of metals, oxides, carbides, or carbon nanotubes. Explain the function of nanofluid in Nuclear reactor (C.O.No.1) [Comprehension]

Q.NO 11. Nano-analysis is commonly used in the nanotechnology detection of crimes. Some of these analyses techniques are Scanning Electron Microscopy, Transmission Electron Microscopy, Atomic Force Microscopy, Dynamic Light Scattering, and Raman Microscopy. Explain Transmission electron microscope with a neat sketch. (C.O.No.4)[Comprehension]