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**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

END TERM FINAL EXAMINATION (MAKE UP)

Semester : 2022 - 2023

Course Code: MEC 3009

Course Name: Nanotechnology

Program & Sem: B.Tech, - MECH

Date: 21-01-2023

Time: 1.00 PM to 4.00 PM

Max Marks: 80

Weightage: 40 %

Instructions:

- (i) Read the all questions carefully and answer accordingly.
- (ii) Question paper consists of three parts.
- (iii) Scientific and Non-programmable calculators are permitted

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries two marks.

(10Qx 1M= 10M)

- 1(a). Nanotechnology deals with structures sized between nanometer in at-leastdimension. (C.O.No. 1) [knowledge level]
- 1(b). In 1959, physics Nobel laureate gave a talk at Caltech on the occasion of the American Physical Society meeting. The talk was entitled, (C.O.No. 1) [knowledge level]
- 1(c). Nanomaterials are typically categorized as 0-D, 1-D, 2-D, and 3-D. Give examples of dimensions. (C.O.No.2) [comprehension level]
- 1(d).andmethods are used in Nanomaterial synthesis. (C.O.No. 2) [comprehension level]
- 1(e). For investigating and manipulating the materials under nanoscale the microscopes are broadly grouped into which categories? (C.O.No. 3) [comprehension level]
- 1(f). Electron microscopes have much greater power than light microscopes that uses radiation. (C.O.No. 3) [comprehension level]
- 1(g). From a general point of view, the combined effects of and are the main reasons for the increased lubricating behaviour of nanoparticles. (C.O.No. 4) [comprehension level]
- 1(h). The temperature and thetemperature are fundamental temperature of nanomaterials as they are directly related to the strength of the bonds in the solid. (C.O.No. 4) [comprehension level]

- 1(i). Write two significant drawbacks which were observed when suspensions of solid particles in liquid with sizes in the order of millimeters or micrometers was previously investigated by several researchers. (C.O.No. 5) [comprehension level]
- 1(j). what is Brownian motion in Nano-fluid? (C.O.No. 5) [comprehension level]

Part B [Thought Provoking Questions]

Answer any three Questions. Each Question carries ten marks. (4Qx10M=40M)

2. Identify and write a short note on revolutionary Nanomaterial whose invention in the year 2004 opened up the door for the characterization and functionalization of many Nano products. (C.O.No. 2) [comprehension level]
3. One of the most fascinating and useful aspects of the nanomaterials is their optical property. Explain briefly the parameters which affect the optical property of Nanomaterials. (C.O.No. 4) [comprehension level]
4. “Nano scale materials have extremely high surface to air ratios as compared to large scale materials”. Explain and Prove it. (C.O.No. 2) [comprehension level]
5. Explain working principle of SEM and its applications. (C.O.No. 3) [comprehension level]

Part C [Problem Solving Questions]

Answer any two Questions. Each Question carries fifteen marks. (3Qx10M=30M)

6. What is electron tunneling? Explain in detail about Atomic force microscopy with the aid of a schematic diagram. (C.O.No. 3) [comprehension level]
7. What is Nano-fluid? Explain the application of Nano-fluid in Nuclear power plant and the microprocessor with a neat sketch. (C.O.No. 4) [comprehension level]
8. Elucidate Top-down and Bottom-up methods of Nanomaterial synthesis. Explain Sol-gel process with advantages and disadvantages. (C.O.No. 2) [comprehension level]