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Question Paper Code : 20622

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Sixth/Seventh/Eighth Semester

Mechanical Engineering

GE 6081 – FUNDAMENTALS OF NANOSCIENCE

(Common to : Electrical and Electronics Engineering/Electronics and Instrumentation Engineering/Instrumentation and Control Engineering/Manufacturing Engineering/Production Engineering/Biotechnology/Chemical Engineering/Pharmaceutical Technology/Polymer Technology)

(Regulations 2013)

(Also Common to : PTGE 6081 – Fundamentals of Nanoscience for B.E. (Part-Time) – Sixth Semester – Electrical and Electronics Engineering/ Seventh Semester – Mechanical Engineering (Regulations – 2014))

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between nano wires and nano films.
2. Why do nano particles exhibit a low melting point when compared to the respective bulk materials?
3. List any four day to day live commercial applications of nanotechnology?
4. Identify the category to which sol-gel, MBE, ECAP and laser ablation belong to.
5. Nano-gold no longer glitters with a golden yellow metallic luster. Why?
6. It is desired to synthesize titania nanoparticles of about 2-3 nm in size. Which technique would you choose and also give reason for it.
7. How nano probes are used in medical diagnostics?
8. What do you mean by elastic scattering and inelastic scattering of electrons?
9. What do you mean by primary, secondary, backscattered electrons in relation with SEM?
10. How nano silver inhibits the bacterial action?

PART B — (5 × 13 = 65 marks)

11. (a) What is nano science? Discuss the implications of nano science in the field of physics and chemistry. (13)

Or

- (b) Why [surface area/volume] ratio is very large for nano particles compared to bulk materials? Highlight the effect of surface area increase on mechanical and optical properties. (13)

12. (a) With a neat sketch, explain Mechanical milling process and Vapour phase deposition for synthesis of nano particles? List advantages and disadvantages? (13)

Or

- (b) (i) What are the differences between top down approach and bottom up approach in synthesis of nano materials? (6)

- (ii) Explain molecular beam epitaxy for producing nano materials? (7)

13. (a) Give a detailed account of the nano forms of Carbon. (13)

Or

- (b) Discuss the preparation, structure property relationship and applications of nanoclay. (13)

14. (a) (i) Compare and contrast AFM and SEM. (7)

- (ii) With a neat diagram explain nano-indentation process. (6)

Or

- (b) (i) Explain the principle and working of ESCA technique for nano material characterization? (7)

- (ii) Discuss the basic principle, instrumentation and working of SNOM. (6)

15. (a) Discuss the applications of nano technology in the field of Sensor. (13)

Or

- (b) Write notes on :

- (i) Nano computer

- (ii) Targeted drug delivery. (6 + 7)

PART C — (1 × 15 = 15 marks)

16. (a) Discuss the applications of nano technology in the field of Solar cells. (15)

Or

- (b) Explain the importance of electron microscopy in characterization of nano materials. (15)