E 5874   (Pages : 2)   Reg. No...................................

Name.....................................

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017

Sixth Semester

Choice Based Course—NANO-SCIENCE AND NANO-TECHNOLOGY

(Common for B.Sc. Physics Model and Model II)

[2013 Admission onwards]

Time : Three Hours   Maximum Marks : 80

Part A

Answer all questions, 1 mark each.

1. Very thin surface coating is an example for nano-scale material in ———— dimension.

2. Topdown nano-technology starts with a ———— block of material and by physical methods.

3. Nano-tubes are formed when the sheets of ———— are rolled up into tubes.

4. Nano-scale particles such as cadmium selenide and gallium arsenide are known as ———— dots.

5. Small polarons are governed by ————.

6. The shape of nano-diamonds has been found to be close to ————.

7. Transmission electron microscope uses a ———— to create an image.

8. Nano-wires are linear arrays of ———— formed by self assembly.

9. A carbon nano-tube is a ———— ———— shaped material made of carbon.

10. The behaviour of a nano-electronic SET is controlled by the ———— mechanical effects.

$(10 \times 1 = 10)$

Part B

Answer any eight questions, 2 marks each.

11. State the properties of carbon nano-tubes.

12. What are excitons ?

13. Give the significance of magic numbers.

14. What is thermolysis ?

15. Explain the principle of electron microscopy.

16. Explain TEM.

17. What are ferrofluids ?

18. Explain colossal magnetoresistance.

19. Give the features of Fermi gas.

20. What do you mean by single electron tunnelling process ?

21. State and explain the principle of molecular switches.

22. What is MEMS ? Explain.

$(8 \times 2 = 16)$

Part C

Answer any **six** questions, 4 marks each.

23. Explain the mechanical properties of nano-structured materials.

24. Briefly explain the applications of nano-tubes in computers.

25. Give an account on nano-carbon ferromagnets.

26. Bringout the field ion microscopy and applications.

27. Discuss on RF plasma and its properties.

28. Give an account on optical properties of nano-particles.

29. Write a note on superconductivity applications in nano-technology.

30. Write a note on quantum dot lasers.

31. Briefly explain the working of super molecular switches.

$(6 \times 4 = 24)$

Part D

Answer any **two** questions, 15 marks each.

32. Describe the size effects in smaller systems with examples.

33. Differentiate the energy band structure among conductors, semi-conductors and insulators.

34. Discuss the synthesis and applications of carbon nano-tubes.

35. Describe the scanning probe microscopy. Explain the principle and applications of SPM.

$(2 \times 15 = 30)$