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H – 3382

Eighth Semester B.Tech. Degree Examination, November 2019

(2008 Scheme)

08.801 : NANOELECTRONICS (TA)

Time : 3 Hours

Max. Marks : 100

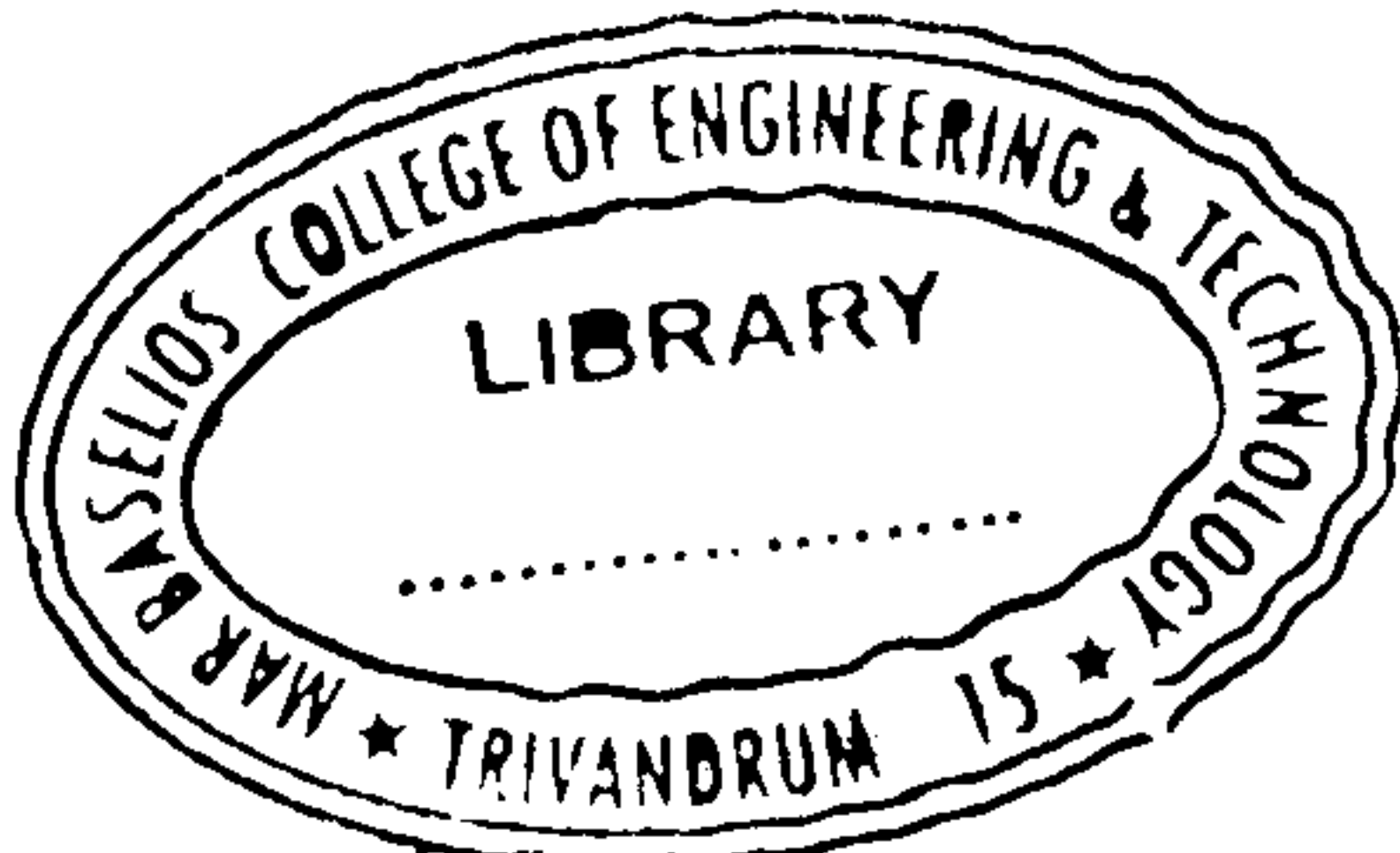
PART – A

Answer **all** questions. Each question carries **4** marks :

1. Discuss the sol gel process used in the production of SiO_2 .
2. Explain the process of three-dimensional island formation by self-assembly.
3. With the help of a diagram show how STM can be used for characterization of nano materials.
4. Calculate the screening length of carriers in Si semiconductor for the following parameters. $\epsilon_r = 11.9$ $\epsilon_0 = 8.854 \times 10^{-12} \text{ F/m}$ $k = 1.38 \times 10^{-23} \text{ J/K}$, $T = 300\text{K}$
Electronic charge = $1.6 \times 10^{-19} \text{ C}$, Background carrier concentration = $1 \times 10^{17} / \text{cm}^3$.
5. Show that the density of states in a one dimensional semiconductor is directly proportional to \sqrt{E} .
6. What is quantum hall effect? What are its applications?

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7. What is quantum conductance? Discuss the Landauer formula for quantum transport.
8. What is quantum confined stark effect with reference to quantum well optical modulator?
9. Discuss the principle of CNT devices and its different types.
10. Write a note on nano electro mechanical systems. What are its applications?

PART – B

Answer **any two** questions from **each** module. Each question carries **10** marks :

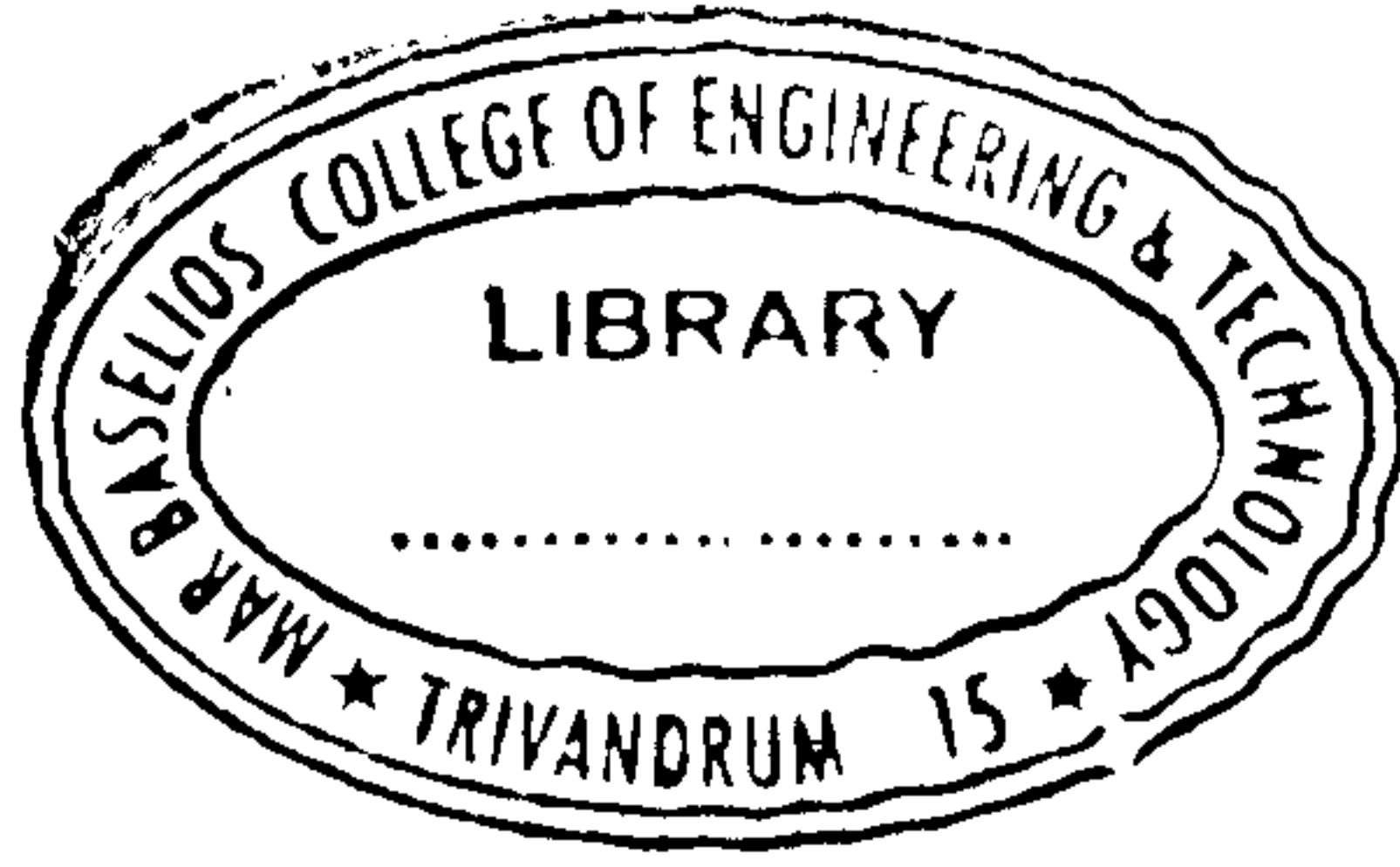
Module – I

11. What is Epitaxy? With the help of a diagram explain Molecular Beam Epitaxy and list its advantages and disadvantages.
12. Discuss the PECVD process of chemical vapor deposition method with the help of a neat diagram.
13. With the help of a diagram briefly explain Ion implantation. Explain the following terms (a) Implantation damage (b) Annealing (c) Channeling. **4 + 3 + 3**

Module – II

14. For quantum wires and quantum dots determine the electron wave functions and show how it is quantized. Find their DOS as a function of energy.
15. Discuss in detail the four different types of electron scattering mechanisms in parallel transport.
16. Explain Aharonov-Bohm effect and Shubnikov-de laas effect in detail.





Module – III

17. What is resonant tunneling effect? Explain the principle of RTD, and show its I-V characteristics.
 18. Discuss the following in detail (a) Coulomb blockage and principle of single electron transistor (b) Principle of Quantum dot LED with the help of necessary diagrams. 5 + 5
 19. With the help of band diagrams compare homo junction and hetero junction bipolar transistors and discuss various advantages of hetero junction transistors over homo junction transistors.
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