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CMDE/M-20 **2022**

DEVICE ELECTRONICS FOR VLSI

Paper–EL-25(iv)

Option–(iv)

Time Allowed : 3 Hours] [Maximum Marks : 75

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. Question No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. (a) What is FINFET? 3

   (b) What is parameter extraction in the device modeling and simulation? 3

   (c) What are the differences between empirical model and analytical models? 3

   (d) What is gate coupling? 3

   (e) What is a quantum well? What are its applications? 3

UNIT–I

2. (a) What are the various approaches used in scaling of MOSFET devices? 8

(b) Describe the velocity overshoot and high field effects in detail. 7

3. (a) Write a short notes on ITRS roadmap. 8

(b) What is Moore's law? What is its role in the development of semiconductor industry? 7

UNIT–II

4. Write a short note on numerical simulation. What are current simulation challenges? 15

5. What is the need of semiconductor device modeling? What are key elements of physical device simulation? 15

UNIT–III

6. (a) What is meaning of technology nodes? 9

(b) What are technological challenges to the MOSFET scaling? 6

7. (a) Write a detailed note on Silvaco's ATLAS simulation tool. 8

(b) What is Billistic transport? Why is it important in the study of scaling of devices? 7

UNIT–IV

8. (a) What are RTDs? Explain their structure and working. 8

   (b) Describe the working of single electron transistor with the help of circuit diagram. 7

9. (a) What is carrier confinement? Why is it important in case of low dimensional structures? 7

   (b) Write a short note on quantum wires and quantum dots. 8