BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH **SEMESTER : II**
BRANCH: ECE **SESSION : SP/2024**

SUBJECT: EC592 NANOELECTRONIC DEVICES AND MATERIALS

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Compare SOI and FINFET technologies on basis of strengths and weakness. Also distinguish between PDSOI and FDSOI.	[5]	1	4
Q.1(b)	Summarize smart-cut method of SOI wafer. Explain four basic limitations of SOI technology.	[5]	1	2
Q.2(a)	Demonstrate Chemical Vapor Deposition method of synthesizing CNT using appropriate diagram and chemical reaction equation. How this method differs from other methods of CNT synthesis?	[5]	2	1&2
Q.2(b)	Differentiate between the following: i) HiPco Process and CoMoCAT Process of scalable production of CNTs. ii) Achiral and Chiral CNTs iii) Arc discharge and Laser ablation	[5]	2	4
Q.3(a)	Comment on necessity of CNT assembly. Briefly describe approaches to CNT assembly.	[5]	3	2
Q.3(b)	Define Dielectrophoresis. Explain four types of Chemical reactivity techniques of separating metallic and semiconducting CNTs.	[5]	3	1
Q.4(a)	Define Coulomb blockade. List two necessary conditions for observing the Coulomb Blockade. Explain the working of single electron transistor using appropriate energy band diagrams with condition of gate voltage.	[5]	4	1&4
Q.4(b)	Classify and illustrate the transport mechanisms of Schottky and ohmic contacts. Summarize the necessary conditions for each to occur. Enumerate the Performance Limit of CNTFETs.	[5]	4	2
Q.5(a)	Draw a general molecular rectifying diode and molecular tunneling diode structure. Illustrate the rectifying action of molecular diode using proper circuits and energy band diagrams of biased and unbiased conditions.	[5]	5	1&2
Q.5(b)	Describe the working of PCRAM and MRAM with proper diagrams. Also, explain the SET and RESET conditions of PCRAM using a temperature versus time graph.	[5]	5	2

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