JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- 2026

B. Tech.-IV Semester (EE (VLSI Design & Technology))

COURSE CODE (CREDITS): 25B11EC415 (3) MAX MARKS: 35

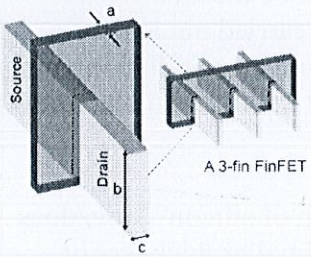
COURSE NAME: INTRODUCTION TO MICROFABRICATION TECHNOLOGY

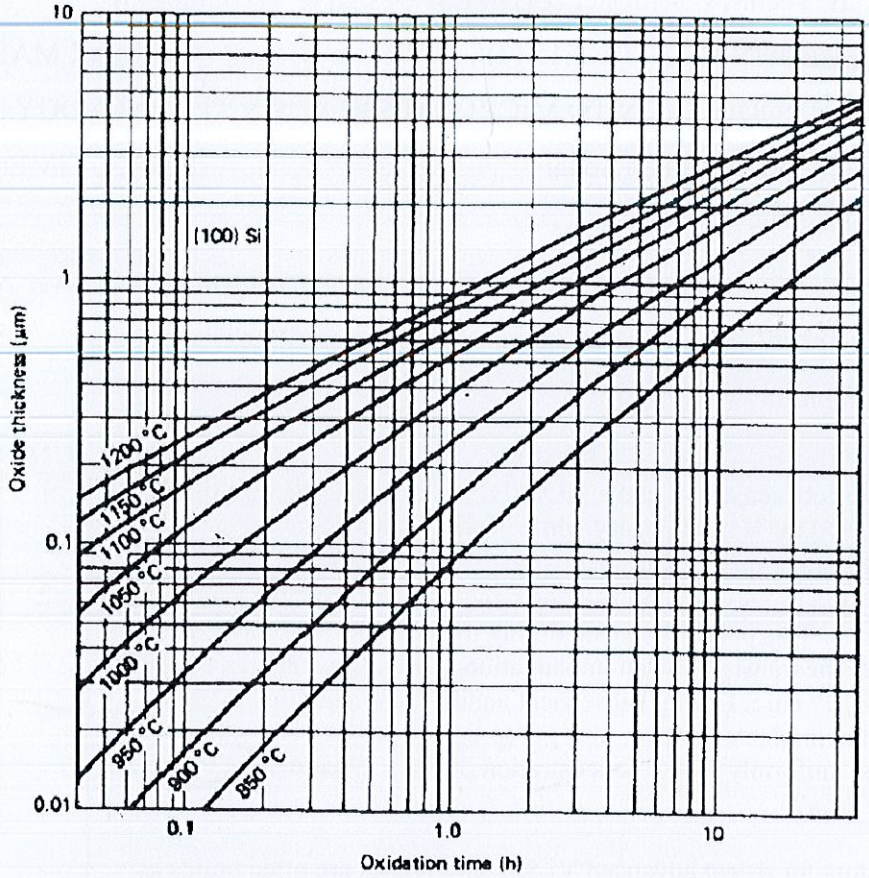
COURSE INSTRUCTOR: Dr. Harsh Sohal MAX. TIME: 2 Hours

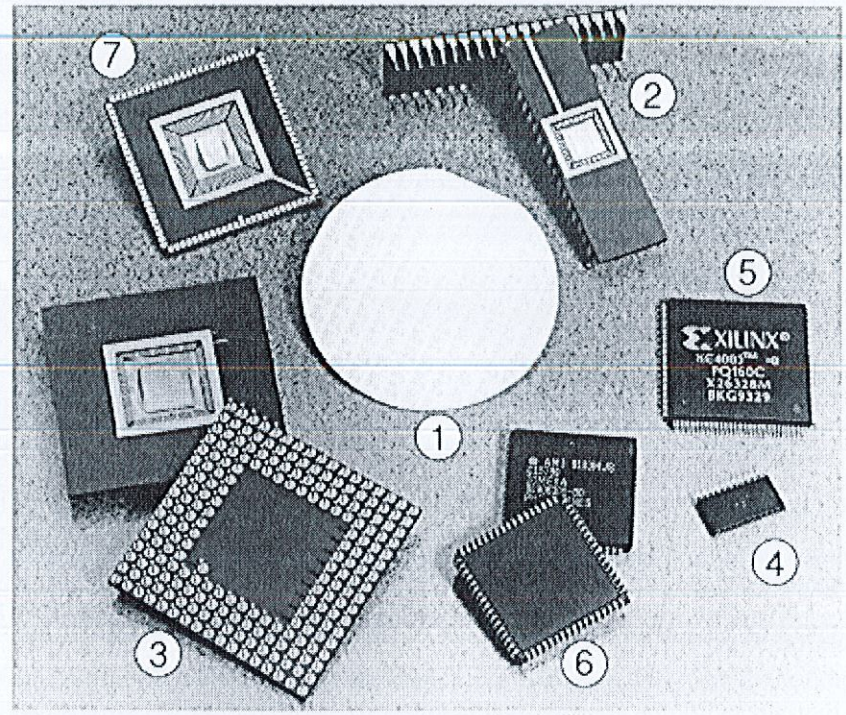
Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of calculator is allowed

Q.No	Question	CO	Marks
Q1	Differentiate between a BJT and a MOSFET. Why is that the MOSFETs have dominated the VLSI industry while making chips like Microprocessors or memories?	1	2+2
Q2	(a) In a CMOS process, the polysilicon deposited on top of the gate oxide is 80 nm thick. This poly gets doped during the *n*-MOSFET source-drain formation of the transistor by an implantation of B^+ ions where the implant dose is 1.6×10^{15} cm^{-2}. During subsequent anneal steps and other thermal processes, the implanted dopant ions get spread throughout the polysilicon layer almost uniformly with a concentration of N_{poly}. What will be your estimate of N_{poly}? (b) Transistors for recent advanced VLSI technologies are often builds as finFETs. A schematic of a 3-fin finFET is shown below along with an enlarged schematic view of one of the fins. In the figure the parameter a = 25 nm; b = 35 nm and c = 10 nm. The fin pitch is 60 nm. Assume gate oxide on the three sides of the fins.  (i) Calculate the gate width(W) of this 3-fin transistor. (ii) Calculate physical gate length (L) of this 3-fin transistor	2	1+2+2

	(c). The following chart shows the time taken to grow thermal oxide in silicon of (100) orientation by wet oxidation, based on this answer the question below.  (i) A (100) orientation was initially subjected to T1 = 900 °C wet oxidation for 30 minutes resulting in an oxide thickness of t_{ox1}. The temperature in the oxidation furnace is brought down to T_2 = 850 °C where the oxidation process is continued. The eventual total thickness of oxide achieved is t_{ox2} = 300 nm. What should be the additional duration of time t_2 for which the oxidation was carried out at the lower temperature T_2? [Give your answer in minutes, within 5 minute error.] [Hint: Subtract time taken to grow t_{ox1} at 850 °C from the time taken to grow t_{ox2} at 850 °C.]		
Q3	What is Deal Grove Model of thermal oxidation of silicon? How does it behave for (a) Higher thickness of oxide (b) smaller thickness of oxide?	3	5
Q4	Explain the effect of the following parameters on silicon oxidation in a foundry with suitable diagrams and graphs: (a) Temperature (b) Ambient type (c) Substrate Orientation (d) Substrate Doping	3	1.5x4=6
Q5	What are the requirements of thin films used in VLSI Microfabrication Industry? Classify thin films based on the method of formation.	4	1.5+1.5=3

Q6	List and explain in detail the (a) Mechanical (b) Electrical Properties of thin films in Microfabrication industry.	3	2+2
Q7	(a) Identify the package types shown in the image below:  (b) Explain the following technologies to connect a die to the package in detail with diagrams. (i) Wire Bonding (ii) Tape Automated Bonding (TAB) (iii) Flip-chip Mounting	4	2+6