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Bengaluru

Mid Term Examinations - October 2026

Date: 05/10/2026 **Time:** 09:30 AM - 11:00 AM

Course Code: ECE6017 **Course Name:** IC Fabrication Technology

Semester: Third Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2
Marks	36	54

PART-A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	Define anisotropy and its importance in IC fabrication.	2	CO1	BT1
2	Define crystal growth	2	CO1	BT1
3	Write the chemical reaction for the reduction of silica to silicon define it.	2	CO1	BT1
4	Define dry oxidation in semiconductor processing, including the conditions involved and its role in forming high-quality oxide layers for device fabrication	2	CO2	BT1
5	Define electron beam lithography and its role in high-resolution patterning for advanced semiconductor device fabrication	2	CO2	BT1

PART-B: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
6	During the preparation of high-purity silicon crystals for IC fabrication, explain how the operating conditions involved in the movement of the molten zone, including heating conditions, zone travel speed, and thermal gradients across the crystal, influence oxygen incorporation, crystal purity, and the formation of defects in the resulting silicon ingot.	10	CO1	BT2
7	In semiconductor manufacturing, a sequence of carefully controlled processing steps is required to transform a high-purity silicon wafer into a functional integrated circuit; explain the flow of fabrication contribute to the formation of the final device.	10	CO1	BT2

PART-C: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
8	In X-ray lithography, achieving accurate transfer of increasingly smaller IC patterns depends on the coordinated selection of radiation wavelength, mask material and thickness, resist characteristics, exposure parameters, and mask-to-wafer arrangement, where inappropriate selection of any one parameter can introduce diffraction effects, pattern distortion, linewidth variation, or loss of resolution; apply suitable X-ray lithography parameters and process conditions to obtain high-resolution and dimensionally accurate pattern transfer for submicron semiconductor device fabrication.	10	CO2	BT3

9	In electron-beam lithography, nanoscale pattern formation without a physical mask requires careful control of beam and resist parameters, since changes in beam energy, beam diameter, resist sensitivity, writing strategy, and electron scattering can affect both the quality and speed of pattern generation; apply suitable electron-beam lithography parameters and writing conditions to obtain high-resolution, dimensionally accurate patterns while minimizing exposure time.	10	CO2	BT3

PART-D: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
10	In thermal oxidation of silicon, the oxide thickness increases with oxidation time according to the Deal–Grove model. For an oxidation process having A=0.10 µm , B=0.02 µm2/hr, and τ=0, calculate the oxide thickness x for the following oxidation times and plot a graph of oxide thickness x versus oxidation time t using the relation x2+Ax=Bt **Time, t (hr) A (µm) B (µm²/hr) Oxide thickness, x (µm)** **0 0.10 0.02 —** **1 0.10 0.02 —** **2 0.10 0.02 —** **4 0.10 0.02 —** **8 0.10 0.02 —** **12 0.10 0.02 —** **16 0.10 0.02 —** Calculate x for each given value of t tabulate the results, and plot the x versus t graph to illustrate the oxidation-growth behavior.	10	CO2	BT3
11	In semiconductor fabrication, dry etching is used for the controlled removal of material from the wafer surface; explain the principle of dry etching, the role of plasma in the etching process, and its major advantages over wet etching.	10	CO1	BT2

PART-E: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
12	In silicon-based IC fabrication, the quality and electrical properties of the oxide layer depend strongly on the oxidizing environment and process conditions; explain how the use of dry oxygen, oxidation temperature, oxidation time, and wafer surface condition influences the oxide growth rate, thickness, uniformity, and quality during dry oxidation.	10	CO2	BT2
13	In silicon-based IC fabrication, rapid formation of silicon dioxide is required for applications involving relatively thick oxide layers; explain how the presence of water vapour, oxidation temperature, oxidation time, and oxidant supply influences the oxide growth rate, thickness, uniformity, and characteristics during wet oxidation.	10	CO2	BT2