

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION)**

**CLASS: BE  
BRANCH: ECE**

**SEMESTER: VII  
SESSION : MO/2019**

**SUBJECT : MEC1019 MICROELECTRONIC DEVICES AND CIRCUITS**

**TIME: 1.5 HOURS**

**FULL MARKS: 25**

**INSTRUCTIONS:**

1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

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- Q1 (a) Discuss the variation in threshold voltage in case of [2.5]  
i) short channel devices  
ii) Narrow channel devices and  
iii) subthreshold region.
- (b) Discuss the Oxidation and metallization process. Also derive the expression for oxide layer thickness and explain it. [2.5]
- Q2 (a) Draw a circuit diagram of a CMOS inverter. Draw its transfer characteristics and explain its operation. Obtain the expression of  $V_{IL}$  Resistive load MOS inverter [2.5]
- (b) How pure single crystal silicon ingot is obtained for sand? [2.5]
- Q3 (a) Draw the VTC curve with piecewise linear approximation and show  $V_{OH}$ ,  $V_{IH}$ ,  $V_{OL}$ ,  $V_{IL}$  on curve? Considering  $dV_{out} / dV_{in} = -1$ , write the expression of  $V_{IH}$ ,  $V_{IL}$  in terms of  $V_m$  and  $V_{DD}$ . [2.5]
- (b) What is the effect of scaling on RC delay? Why scaling trend "keeping 't' constant and scaling only W" arise and what is its effect on RC delay. [2.5]
- Q4 (a) Define testability, observability, controllability and fault coverage. Why the testability is proportional to observability and controllability? [2.5]
- (b) What is the Ad Hoc error testing? What are the common techniques for ad hoc testing? Write two useful tricks for Ad Hoc testing. [2.5]
- Q5 (a) What are the advantages of [2]  
i) active load and  
ii) resistive load used in single stage common source amplifier circuit?
- (b) Discuss common source amplifier circuit with p-channel current mirror as active load. Obtain the simplified small signal model for it. [3]
- Q6 (a) Write short note on any two of the following [5]  
(a) 2nd order Effects  
(b) Constant field and constant voltage scaling  
(c) Mixed signal VLSI chip

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