Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –I Examination Feb. - 2012

Subject code: 714203N **Date: 17/02/2012**

Subject Name: Advanced MOSFET Modeling

Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	With the help of energy band diagram explain the junction phenomenon of metal and semiconductor. Also discuss different issues in metal-semiconductor junction.	**07**
	(b)	Write a note on Fermi Diac Distribution Function and its properties.	**07**
Q.2	**(a)**	Explain C-V plot for nMOS & pMOS.	**07**
	(b)	Derive the equation for threshold voltage of MOSFET.	**07**
		OR	
	(b)	The n-MOSFET fabricated has gate dimensions of W=L=5 μm. Estimate the current I_{DS} where a bias condition of V_{GS} = 1.5 V, V_{SB} = 0 V. V_{DS} =5 V. Here $V_{TO.n}$ = 1.105 V, and μ_n = 0.75 m^2-$v^{-1}s^{-1}$ and C_{ox} = 11.5 x 10^{-4} F/m^2.	**07**
Q.3	**(a)**	Explain drain induced barrier lowering effect by reducing channel length. Also discuss punch through concept.	**07**
	(b)	Compare different scalling techniques.	**07**
		OR	
Q.3	**(a)**	Write a note on hot carrier effects.	**07**
	(b)	A pMOS transistor was fabricated on a n type substrate with a bulk doping density N_D = 10^{16} cm^{-3}, polysilicon gate doping density N_D = 10^{20} cm^{-3}, gate oxide thickness t_{ox} = 0.1 μm, and Q_{ox}/q = 4 x 10^{10} cm^{-2}. Use ε_{si} =11.7ε_0 and ε_{ox} = 3.97ε_0 for the dielectric coefficient of silicon and silicon-dioxide interface respectively. Calculate the threshold voltage V_{T0} for V_{SB} =0V.	**07**
Q.4	**(a)**	Derive the equations for terminal currents in quasi static operation of MOS.	**07**
	(b)	Which are the properties of good models?	**07**
		OR	
Q.4	**(a)**	Define & state the transit time under DC condition for all mode of inversion of MOS transistor.	**07**
	(b)	Which types of effects can occur in the physical model of MOS transistor?	**07**
Q.5	**(a)**	Discuss effects of surface and drain series resistances.	**07**
	(b)	Discuss different types of tests to evaluate the MOSFET models.	**07**
		OR	
Q.5	**(a)**	Write short note on body effect.	**07**
	(b)	Write a note on non quasi static modeling of MOS transistor.	**07**

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