Week 9 Quiz 2: AC Response (PN Junctions)
ECE 606: Solid State Devices
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Purdue University, Spring 2013

Answer the **four multiple choice questions** below by choosing the **one, best answer**. Then **ask a question** about the lecture.

1) What is the small signal circuit model of a forward-biased diode?
   a) A resistor in series with the parallel combination of two capacitors.
   b) A resistor in parallel with two capacitors and then this parallel connection of three elements is in series with another resistor.
   c) An inductor in parallel with two capacitors and then this parallel connection of three elements is in series with another resistor.
   d) A resistor in parallel with an inductor and capacitor and then this parallel connection of three elements is in series with another resistor.
   e) A resistor in series with a capacitor.

2) What can we determine from a plot of one over junction capacitance squared vs. reverse bias voltage?
   a) The minority carrier lifetime.
   b) The minority carrier diffusion coefficient.
   c) The semiconductor bandgap.
   d) The doping density.
   e) The series resistance.

3) The dielectric relaxation time describes the temporal response of majority carriers. Which of the expressions below is the correct dielectric relaxation time?
   a) \( \tau_r = \sigma \kappa_s \varepsilon_0 \)
   b) \( \tau_r = \kappa_s \sigma / \varepsilon_0 \)
   c) \( \tau_r = \sigma / L_n \)
   d) \( \tau_r = \kappa_s \varepsilon_0 / D_n \)
   e) \( \tau_r = \kappa_s \varepsilon_0 / \sigma \)

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4) When is the diffusion capacitance important?

a) For low DC forward bias and for frequencies that are well below $\frac{1}{(2\pi \tau_n)}$.
b) For low DC forward bias and for frequencies that are well above $\frac{1}{(2\pi \tau_n)}$.
c) For high DC forward bias and for frequencies that are well below $\frac{1}{(2\pi \tau_n)}$.
d) For high DC forward bias and for frequencies that are above $\frac{1}{(2\pi \tau_n)}$.
e) For low DC forward bias and for frequencies that are well below $\frac{1}{(2\pi \tau_n)}$.

5) What question(s) do you have about this lecture?

Turn in to Ms. Wanda Dallinger, EE-326 before 4:30 PM Monday, March 18