Exam in Electronics II

Course code | E7014E
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Exam date | 2009-01-15
Exam time | 09.00 – 13.00
Grade 5 | 25 – 30 credits
Grade 4 | 20 – 24 credits
Grade 3 | 15 – 19 credits

Teacher on call | Kalevi Hyyppä 1144, (070-3621535)

Allowed aids

- BETA Calculator
- Handwritten lecture notes on noise by Kalevi Hyyppä

Good Luck!
1. 2 credits)
You are going to design a low frequency amplifier for a source with an internal resistance of 100 Ω. The voltage gain should be around 100, the available supply voltage is 12 V and the load resistance is 1 kΩ. Which alternative should you choose?
   A) A CD amplifier followed by a CE amplifier.
   B) A CS amplifier followed by a CC amplifier.
   C) A CE amplifier followed by a CD amplifier.
   D) A CE amplifier followed by CS amplifier.

2. (2 credits)
What alternative is a reason to include decoupling capacitors when you design an amplifier?
   A) The gain of the amplifier increases.
   B) The bandwidth of the amplifier increases.
   C) The input impedance of the amplifier increases.
   D) The stability of the amplifier increases.

3. (2 credits)
What is the most important reason to replace the resistors connected to the drains of an IC MOS differential pair with active current sources?
   A) The noise in the amplifier becomes smaller.
   B) The differential gain becomes bigger.
   C) The common mode gain becomes smaller.
   D) The bandwidth of the amplifier becomes bigger.

4. (2 credits)
Why is the non-inverting configuration normally a better choice than the inverting configuration when you design a voltage amplifier with an op-amp?
   A) The gain can be predicted with high accuracy.
   B) The input resistance becomes smaller.
   C) The input resistance becomes bigger.
   D) The output resistance becomes bigger.

5. (2 credits)
What is the main function of the internal compensation capacitor in an op-amp?
   A) To shape the open loop gain of the op-amp to make it unconditionally stable.
   B) To decrease the phase margin of the op-amp.
   C) To decrease the gain margin of the op-amp.
   D) To increase the bandwidth of the op-amp.
6. (2 credits)
What property of a piezoelectric crystal enables it to be used in a Pierce oscillator?
A) The series resistance is relatively high.
B) The reactance is positive between its two resonance frequencies.
C) The equivalent inductance is very high.
D) The two resonance frequencies are high.

7. (2 credits)
What is the correct unit for the RMS value of shot noise?
A) $V^2$
B) $V$
C) $A^2 / \text{Hz}$
D) $A$

8. (5 credits)
Solve problem 6.70 in the textbook by Sedra/Smith.

9. (5 credits)
Solve problem 7.16 in the textbook by Sedra/Smith.

10. (6 credits)
Solve problem 13.51 in the textbook by Sedra/Smith.