II B.Tech II Semester Examinations,April/May 2012
SEMI CONDUCTOR DEVICES AND CIRCUITS
Mechatronics

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Prove that the concentration of holes in an intrinsic semiconductor is given by
   $P = N_{VX}e^{-(E_F-E_V)/kT}$

   (b) Define Mass Action Law & Law of junction in semiconductors.   [10+6]

2. (a) Draw the circuit diagram of Clapp oscillator and explain the operation Enumerate advantages of this over the Colpitt's or Hartely oscillator.

   (b) In Colpitt's oscillator circuit, C_1 =1nF, C_2=10nF, L=110μH. Find feedback factor and operating frequency.   [10+6]

3. Derive all the necessary parameters of HWR and explain.   [16]

4. (a) When an electron is placed in a magnetic field with a period of rotation T = [35.5/B] 10^{-12} sec. Show that the trajectory of electron is a circle.

   (b) What is the radius described by an electron placed in a magnetic field, perpendicular to its motion, when the accelerating potential is 900V, and B = 0.01wb/m^2. What is the time period of rotation?   [8+8]

5. (a) Explain the operation of n - channel JFET with a neat sketch and draw the characteristics.

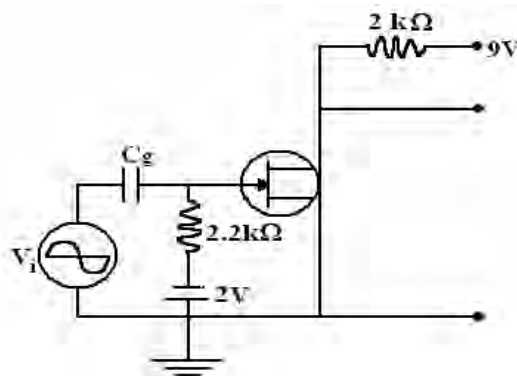   (b) For a fixed bias circuit shown figure 4. I_{DSS}=6mA, V_P =-6v. Find drain current and V_{DS}.   [8+8]

Figure 1:

6. (a) What are the different configurations of BJT? Explain briefly.

   (b) Define I$_{CBO}$ and I$_{CEO}$.

(c) What is the order of magnitude of I_{CBO} for Si transistor and Ge transistor? How does I_{CBO} vary with temperature?   [8+4+4]

7. (a) Explain common emitter configuration of a BJT and draw the input and output characteristics.

(b) Compare different parameters of CB , CE, CC configurations.   [10+6]

8. Derive the expression for input resistance with feedback R_{if} and output resistance, R_{of} with following feedback configurations based on their equivalent circuits.

(a) Voltage shunt feedback amplifier

(b) Current series feedvback amplifier.   [8+8]

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R07   **Set No. 4**

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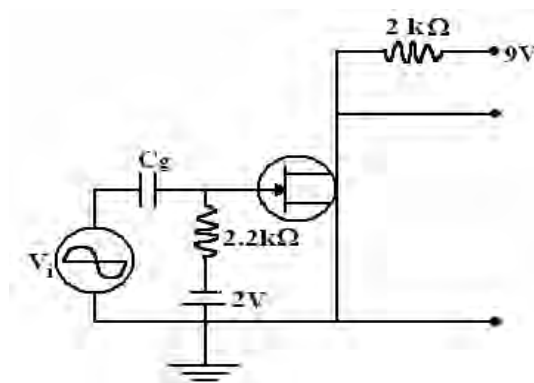

Figure 2:

6. (a) When an electron is placed in a magnetic field with a period of rotation T =
   [35.5/B] 10^{-12} sec. Show that the trajectory of electron is a circle.

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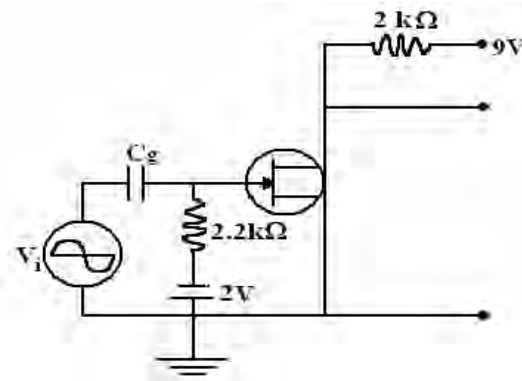

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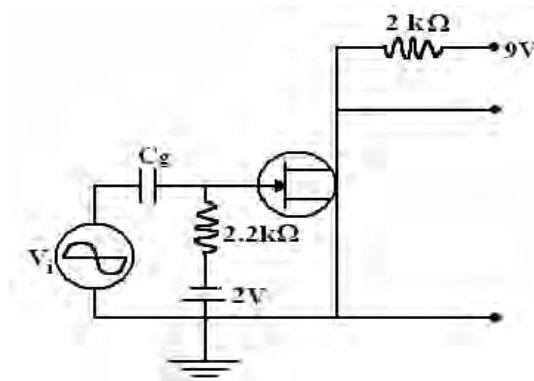

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