Code No: R07A10401 **Set No. 1**

I B.Tech Semester Regular Examinations, June 2009
BASIC ELECTRONIC DEVICES AND CIRCUITS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive the expressions for acceleration, Velocity and displacement of a charged particle placed in an electric field E.
   (b) Two parallel plates of a capacitor are separated by 4 cms. An electron is at rest initally at the bottom plate. Voltage is applied between the plates, which increases linearly from 0V to 8V in 0.1 m.sec. If the top plate is +ve, determine:
      i. The speed of electron in 40 n sec
      ii. The distance traversed by the electron in 40 n sec. [8+8]

2. (a) Determine the resistivity of Germanium:
      i. in intrinsic condition at 300 ^{0}K
      ii. with donor impurity of 1 in 10^7
      iii. with acceptor impurity of 1 in 10^8
      Give for germanium at room temperature. $n_i = 2.5 \times 10^{13}/cm^3$; $\mu_p = 1800$ cm^2/V-sec, $\mu_n = 3800$ cm^2/V-sec and number of Germanium atoms/cm^3 $= 4.4 \times 10^{22}$.
   (b) Explain about Avalanche and Zener breakdown. [10+6]

3. (a) Define the following terms of a half wave rectifier with resistive load:
      i. Ripple factor
      ii. Peak inverse voltage
      iii. Rectification efficiency.
   (b) A 230 V, 60Hz voltage is applied to the primary of a 5 : 1 step down, center tapped transformer used in a full wave rectifier having a load of 900Ω. If the diode resistance and the secondary coil resistance together has a resistance of 100Ω, determine:
      i. dc voltage across the load
      ii. dc current flowing through the load
      iii. dc power delivered to the load
      iv. PIV across each diode.
      v. Ripple voltage and its frequency. [6+10]

4. (a) Compare CB, CE, CC configurations with respect to current gain, voltage gain, input resistance and output resistance.

(b) Explain what is meant by early effect in the case of tyransistor and what is its consequences. [10+6]

5. What is meant by compensation? Explain the different types of compensation technique with neat circuit diagrams and also compare this with stabilization techniques. [16]

6. Obtain CE h parameters in terms of CB h parameters. [16]

7. (a) Calculate voltage gain, input impedance and output impedance of a CE amplifier with current-shunt negative feedback.

   (b) Explain how negative feedback can increase the bandwidth of an amplifier. [10+6]

8. For the feedback network shown in figure 8 find the transfer function and the input impedance. If this network is used in a phase shift oscillator, find the frequency of oscillation and the minimum amplifier voltage gain. Assume that the network does not load down the amplifier. [16]

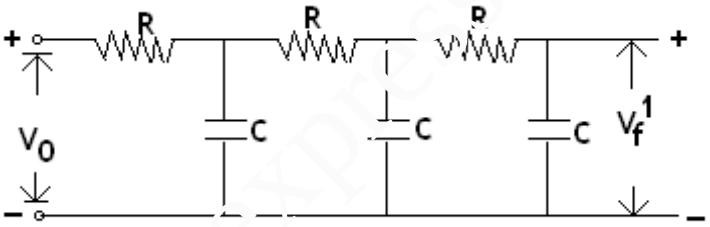

Figure 8

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Code No: R07A10401 **Set No. 2**

I B.Tech Semester Regular Examinations, June 2009
BASIC ELECTRONIC DEVICES AND CIRCUITS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) With the help of necessary equations show the trajectory of an electron is cycloid when it is placed in perpendicular electric and magnetic fields.
   (b) Determine the velocity and kinetic energy of an electron accelerated through potential of 3 KV. [8+8]

2. (a) What are the various applications of p-n junction diode? Explain them.
   (b) What are the specifications of p-n junction diode? Explain how reverse saturation current varies with temperature both in Si and Ge diodes.
   (c) Explain about the characteristics of zener diode. [5+6+5]

3. (a) Define the following terms of a half wave rectifier with resistive load:
      i. Ripple factor
      ii. Peak inverse voltage
      iii. Rectification efficiency.
   (b) A 230 V, 60Hz voltage is applied to the primary of a 5 : 1 step down, center tapped transformer used in a full wave rectifier having a load of 900Ω. If the diode resistance and the secondary coil resistance together has a resistance of 100Ω, determine
      i. dc voltage across the load
      ii. dc current flowing through the load
      iii. dc power delivered to the load
      iv. PIV across each diode.
      v. Ripple voltage and its frequency. [6+10]

4. (a) For a small signal JFET $i_D = f(V_{GS}, V_{DS})$. Obtain expressions for i_D and hence define g_m, r_d and μ.
   (b) From the definition of g_m and r_d obtain expression for μ.
   (c) For an n-channel silicon FET with $a = 3\times10^{-4}$cm and $N_D = 10^{15}$ electrons/cm^3. Find the pinch off voltage. [5+5+6]

5. (a) What is meant by stabilization? Define the different stability factors.
   (b) Consider the self bias circuit where V_{cc}=22.5volts, R_c=5.6KΩ, R_e=1KΩ, R_2=10KΩ and R_1=90KΩ, h_{fe}=55, V_{be}=0.6V. The transistor operates in active region. Determine the operating point and its stability factor. [8+8]

6. Obtain CB h parameters in terms of CE h parameters. [16]

7. (a) What is the effect of negative feedback on the output noise level of an amplifier? Does it improve the signal-to-noise ratio?

   (b) An amplifier with negative feedback has a gain of -100. It is found that without feedback, an input signal of 50mV is required to produce a given output, whereas with feedback in the input signal must be 0.6V for the same output. Find the amount of feedback in decibels and the values of open loop gain and feedback factor. [6+10]

8. For the FET oscillator shown in figure 8 find V_f' / V_o, the frequency of oscillations and the minimum gain of the source follower required for oscillations. [16]

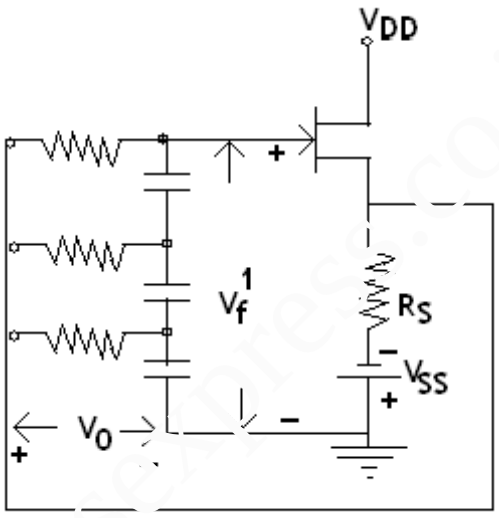

Figure 8

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Code No: R07A10401 **Set No. 3**

I B.Tech Semester Regular Examinations, June 2009
BASIC ELECTRONIC DEVICES AND CIRCUITS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive the expression for the magnetic deflection sensitivity in a CRT.
   (b) Compare electro static and magneto static deflection sensitivities in all respects. [8+8]

2. (a) Derive diode equation and discuss about various parameters involved in the equation.
   (b) Determine the values of forward current in the case of a p-n junction diode, with I_0=10 micro amperes. V_F = 0.8V at T = 300°k. Assume silicon diode. [10+6]

3. (a) A 15-0-15 Volts (rms) ideal transformer is used with a full wave rectifier circuit with diodes having forward drop of 1 volt. The load is a resistance of 100ohm and a capacitor of 10,000μf is used as a filter across the load resistance. Calculate the dc load current and voltage.
   (b) Explain the working of the Half wave rectifier circuit with neat sketch of waveforms at various points in the circuit. [8+8]

4. (a) Draw the circuit and explain the drain and gate characteristics of a JFET in C.S. configuration.
   (b) Give the parameter values and specifications of a JFET. [10+6]

5. (a) Determine the stability factor for the circuit shown in figure 5a.

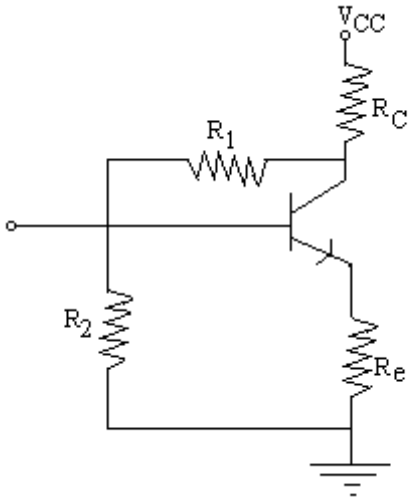

Figure 5a

(b) Calculate the thermal resistance for the 2N338 transistor for which the manufacturer specifies $P_{c,max}$=125mW at 25^0C free-air temperature and maximum junction temperature T_j=150^0C. What is the junction temperature if the collector dissipation is 75mW? [8+8]

6. (a) Explain the method of evaluating h parameters for a transistor in CC configuration.

(b) A CB amplifier is driven by a voltage source of internal resistance R_s=1kΩ. The load impedance is R_L=1K. The transistor parameters are h_{ib}= 22Ω, h_{fb} = -0.98, h_{rb}=2.9×10^{-4}, h_{ob}= 0.5μA/V. Compute current gain, voltage gain, input and output impedance of the amplifier. [8+8]

7. (a) An amplifier has a gain of -100 and a distortion of 8%. What is the effect of introducing negative feedback with feedback factor of 0.05?

(b) Find A_f for a CE stage with an un bypassed emitter resistor. [8+8]

8. (a) Find the capacitance of the capacitor used in the RC network employed in the phase shift oscillator, if the frequency of oscillation is 956Hz and R=1M Ω.

(b) Show that the amplifier used in the wien-bridge oscillator must have a gain greater than 3 for sustained oscillations. [8+8]

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Code No: R07A10401 **Set No. 4**

I B.Tech Semester Regular Examinations, June 2009
BASIC ELECTRONIC DEVICES AND CIRCUITS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive an expression for magnetic deflection sensitivity of C.R.O.
   (b) An electron is injected with an initial velocity V_{ox} of 4×10^6 m/sec halfway between two large parallel plates 0.5 cm apart. The XZ plane is parallel to the plates. There is a voltage of 200V impressed between the plates, and a magnetic field of 10 mwb/m^2 perpendicular to the plates, directed from the positive to the negative plate. Where does the electron strike the positive plate and with what velocity? [8+8]

2. (a) Explain the formation of depletion region in an open-circuited p-n junction with neat sketches.
   (b) A p-n junction diode has a reverse saturation current of 30 μA at a temperature of 125 ^{0}C. At the same temperature find the dynamic resistance for 0.2V bias in forward and reverse direction. [8+8]

3. (a) Draw the circuit diagram of a Half wave rectifier. Explain the operation of the circuit with relevant waveforms.
   (b) A bridge rectifier uses four identical diodes having forward resistance of 5Ω each. Transformer secondary resistance is 5 ohms and the secondary voltage is 30 V (rms). Determine the dc output voltage for I_{dc} = 200 mA and value of the output ripple voltage. [8+8]

4. (a) Why CE circuit is preferred to a CB circuit. Describe the operation of PNP grounded emitter transistor amplifier.
   (b) Draw the basic structure of a SCR and explain its characteristics. [8+8]

5. What is meant by biasing? Explain the different types of biasing and derive an expression for its stability factor. With neat circuit diagrams. [16]

6. (a) What is meant by unity gain frequency? What are the limitations of h parameters?
   (b) For any single-transistor amplifier prove that
   $$Y_0 = h_0 \left(\frac{R_s + R_{i\infty}}{R_s + R_{i0}} \right)$$
   Where $R_{i\infty} = R_i$ for $R_L = \infty$, and $R_{i0} = R_i$ for $R_L = 0$. [8+8]

7. (a) Explain how the nonlinear distortion can be reduced by using negative feedback in an amplifier.

(b) Calculate voltage gain, input impedance and output impedance of a CE amplifier with Voltage-Series negative feedback. [8+8]

8. (a) Prove that oscillations will not be sustained if, at the oscillator frequency, the magnitude of the product of the transfer gain and feedback factor are less than unity.

(b) Explain how to stabilize the amplitude against variation due to fluctuations occasioned in wein bridge oscillator? [8+8]

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