Code No: RR10205 **Set No. 1**

I B.Tech Supplementary Examinations, November/December 2005
ELECTRONIC DEVICES & CIRCUITS
(Common to Electrical & Electronic Engineering, Electronics & Communication Engineering, Computer Science & Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics & Control Engineering, Computer Science & Systems Engineering, Electronics & Telematics, Electronics & Computer Engineering and Instrumentation & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) List out the advantages and disadvantages of both electrostatic and electromagnetic deflection system ?
   (b) Explain the terms [8+8]
      i. Potential
      ii. Electron Volt
      iii. Charge density
      iv. Current density

2. (a) What is meant by the minority carrier storage time of a diode.
   (b) A Zener voltage regulator circuit is to maintain constant voltage at 60V, over a current range from 5 to 50mA. The input supply voltage is 200V. Determine the value of resistance R to be connected in the circuit, for voltage regulation from load current $I_L = 0mA$ to I_L max, the maximum possible value of I_L. What is the value of I_L max? [6+10]

3. (a) What is the cause of surge in rectifier circuits using capacitor filter. How is the current limited?
   (b) In a full wave rectifier the required dc voltage is 9V and the diode drop is 0.8V calculate ac rms input voltage required in case of bridge rectifier circuit and center tapped full wave rectifier circuit.
   (c) Derive the expression for the ripple factor of half wave rectifier and full wave rectifier. [4+6+6]

4. (a) Explain the input and output characteristics of the transistor in CE configuration.
   (b) Given an NPN transistor for which $\alpha = 0.98$, $I_{CO} = 2\mu A$ and $I_{EO} = 1.6\mu A$. A common emitter connection is used and $V_{CC} = 12$v and $R_L = 4.0$ k. what is the minimum base current required in order that transistor enter in to saturation region. [10+6]

5. (a) Draw the circuit diagram of a saw tooth wave form generator using UJT and explain its operation.

(b) What is meant by Pinch off voltage pinch of locus of JFET? Mark Pinch of locus form drain characteristic.

6. (a) Compare transistor amplifier configurations related to A_I, A_V, input resistance R_I and out resistance R_O.

   (b) For a CE amplifier if $R_2 = R_S = 1000\Omega$ and $h_{ie} = 1100\Omega \quad h_{re} = 2.5 \times 10^{-4}$ $h_{fe} = 50 \quad h_{oe} = 25\mu a/v$ find $A_I, R_i, A_V, A_{VS}, A_{1S}$. [8+8]

7. (a) Explain the concept of feedback as applied to electronic amplifier circuits. What are the advantages and disadvantages of positive and negative feedback?

   (b) With the help of general block diagram explain the term feedback.

   (c) Define the following terms in connection with feedback. [6+4+6]

   i. Return difference feedback.

   ii. Closed loop voltage gain.

   iii. Open loop voltage gain.

8. (a) Discuss and explain the basic circuit of an LC oscillator and derive the condition for the oscillations?

   (b) A crystal has L=2H, C=0.01PF and R=2kΩ. Its mounting capacitance is 2PF. Calculate its series and parallel resonating frequency. [10+6]

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) An electron is moving perpendicular to magnetic field 'B'. Derive the expression for radius 'R' of the trajectory and period of rotation T
   (b) Derive the expression for the electro magnetic deflection sensitivity in the case of the CRT. [8+8]

2. (a) Sketch V-I characteristics of SC diode for the following conditions
      i. $R_f = 0, V_r = 0,\ R_r = \alpha$
      ii. $R_f \neq 0 V_r \neq 0\ R_r = \alpha$
      iii. $R_f \neq 0 V_r = 0,\ R_r = \alpha$.
   (b) Determine the values of forward current in the case of a p-n junction diode, with Io=10 micro amperes. $V_F = 0.8$v at $T = 300^0 k$. Assume silicon diode. [10+6]

3. Derive expression for D.C. or average value of current, R.M.S. value of current and Average voltage across the load for a half wave rectifier. [16]

4. (a) What are the different configurations of BJT. Explain?
   (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]

5. (a) Define the different parameters of FET.
   (b) What are special semiconductor devices? Give explanation for any two devices. [8+8]

6. (a) Define the stability factors, S', S'' and what is the need of this in BJT circuits.
   (b) Draw the circuit diagram of a self bias BJT circuit and explain how to determine the values of R_1 and R_2. [6+10]

7. (a) Derive an expression for lower cutoff frequency of feedback amplifier.

(b) The circuit parameters in 2-stage self-bias voltage-series feedback amplifier are:
$R_S = 150\Omega$, $R_1 = 220K$, $R_2 = 22K$, $R_{c1} = 22K$, $R_{e1} = 150\Omega$, $R_{c2} = 5.6K$, $R_f = 10K$. The transistor h-parameters are $h_{ie} = 1000\Omega$, $h_{fe} = 80$, $h_{re} = h_{oe} = 0$. Calculate $\beta, A_v, A_{vf}, R_{if}$ *and* R_{of}. Neglect all capacitances. [6+10]

8. (a) Show that the gain of Wien bridge oscillator using BJT amplifier must be at least 3 for the oscillations to occur.

(b) In a transistorized Hartley oscillator the two inductances are 2mH and 20μH while the frequency is to be changed from 950KHZ to 2050KHZ. Calculate the range over which the capacitor is to be vaired. [10+6]

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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 trajectory of an electron placed in combined electric(E) and magnetic fields(B). Both the fields are perpendicular to each other and the initial velocity is zero
   (b) The magnetic flux density $B = 0.02wb/m^2$ and electric field strength $E = 10^5 v/m$ are uniform fields, perpendicular to each other.A pure source of an electron is placed in a field. Determine the minimum distance from the source at which an electron with 0v will again have 0v in its trajectory under the influence of combined Electric and magnetic fields [8+8]

2. (a) Explain why p-n junction contant potential cannot be measured by placing a voltmeter across the diode terminal.
   (b) With reference to the P-N junction diode. [4+12]
      i. Distinguish between drift current and diffusion current.
      ii. Distinguish between diffusion capacitance and transition capacitance.

3. (a) For a full wave rectifier with shunt capacitance filter derive expression for ripple factor using approximate analysis.
   (b) Why filter circuit is necessary with rectifiers. Give the list of different filters used in rectifier and their merits and demerits. [8+8]

4. (a) What is meant by base width modulation. Explain how input characteristics can be effected due to this effect.
   (b) The current gain of a transistor in CE circuit is 49. Calculate CB current gain and find the base current where the emitter current is 3 mA. [8+8]

5. (a) Determine the pinch off voltage for an N-channel silicon FET with a channel width of $5.6 * 10e(-4)cm$ and a donor concentration of $10e(-15)/cm^3$.Given that dielectric constant of Si is 12.
   (b) A UJT has a firing potential of 20V. It is connected across the capacitor of a series RC circuit with R=100k and C=1000pf supplied by a source of 40V dc. Calculate the time period of the saw tooth waveform generated.

6. (a) Define the stability factors, S', S'' and what is the need of this in BJT circuits.
   (b) Draw the circuit diagram of a self bias BJT circuit and explain how to determine the values of R_1 and R_2. [6+10]

7. (a) Classify various feedback amplifiers.
   (b) For the two stage amplifier circuit (as shown in figure1), the transistors are identical with h_{fe}=50, h_{ie}=2K, h_{re} and h_{oe} are negligible.
   Find [8+8]
   i. $A_{if} = \frac{I_o}{I_s}$,
   ii. $R_i = \frac{V_i}{V_s}$,
   iii. $A_{vf} = \frac{V_o}{V_s}$.

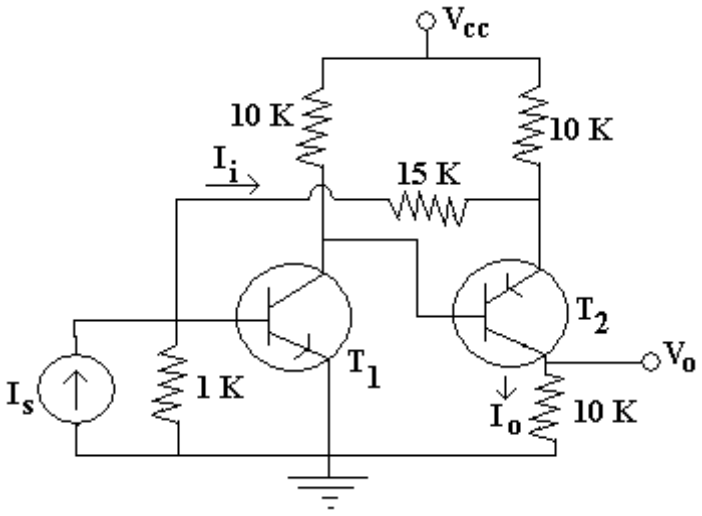

Figure 1:

8. (a) Draw the circuit diagram of a RC phases shift oscillator using BJT. Derive the expression for frequency of oscillators.
   (b) Classify different type of oscillators based on frequency range.
   (c) Why RC oscillators are not suitable for high frequency applications. [8+4+4]

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) List out the advantages and disadvantages of both electrostatic and electromagnetic deflection system ?
   (b) Explain the terms [8+8]
      i. Potential
      ii. Electron Volt
      iii. Charge density
      iv. Current density

2. (a) Derive the expression for Hall voltage V_H.
   (b) What are the applications for Hall voltage?
   (c) What is modified Hall coefficient? Explain? [10+2+4]

3. (a) A 15-0-15 Volts (rms) ideal transformer is used with a full wave rectifier circuit with diodes having forward drop of 1volt. 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) Draw the circuit diagram of a bridge rectifier circuit with Π-section followed by L-section filter and explain its operation. [6+10]

4. (a) With neat sketches explain the cut off region, active region and saturation region of a transistor output characteristics.
   (b) Write about the phenomena of reach through in a transistor. [10+6]

5. (a) The h parameters of a transistor in the CE amplifier mode are: $h_{re} = 1100ohm$, $h_{ie} = 2.5 * 10e(-4)$, $h_{fe} = 50$, $h_{oe} = 25\mu mho$. Determine the current gain and input resistance of the amplifier for a load resistance R_L=1K.
   (b) Mention the advantages of and disadvantages of graphical analysis of the operation of transistor as an amplifier. [8+8]

6. (a) Draw the circuit diagram of small signal CE amplifier circuit and give its equivalent hybrid model. What is the role of C_c and C_e.

(b) Obtain frequency response of CE amplifier circuit and find out its band width. What is the impact of C_C and C_S on the band width? [8+8]

7. (a) Briefly discuss about the effect of feedback on amplifier Bandwidth.

   (b) Draw the frequency response of an amplifier with and without feedback and show the bandwidth for each case and how these two curves are related to gain bandwidth product.

   (c) We have an amplifier of 60db gain. It has an output impendence $Z_o = 10k\Omega$. it is required to modify its output impendence to 500Ω by applying negative feedback.Calculate the value of the feedback factor Also find the percentage change in the over all gain, for 10% change in the gain of the internal amplifiers. [4+6+6]

8. (a) Draw the circuit diagram of a RC phases shift oscillator using BJT. Derive the expression for frequency of oscillators.

   (b) Classify different type of oscillators based on frequency range.

   (c) Why RC oscillators are not suitable for high frequency applications. [8+4+4]

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