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

I B.Tech Supplimentary Examinations, Aug/Sep 2007
ELECTRONIC DEVICES AND 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) 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 4cms. An electron is at rest initially 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 [8+8]
      i. The speed of electron in 40.n sec
      ii. The distance traversed by the electron in 40.n.sec
2. (a) Define law of junction? Explain about the term cut-in voltage associated with p-n junction diode? How do you obtain cut in voltage from forward V-I characteristics?
   (b) Briefly discuss about Avalaunche break down and Zenar break down/? [8+8]
3. (a) Explain the circuit diagram of a single phase full-wave bridge rectifier and sketch the input, output waveforms.
   (b) Define percentage regulation and prove that the regulation of both half wave and full wave rectifier is given by percentage regulation is equal to $\frac{R_f}{R_L} \times 100\%$ [8+8]
4. (a) Sketch a family of CE input and output characteristics for a transistor. Explain the shape of the curves qualitatively.
   (b) Sketch the input and output characteristics of the common collector configurations. [8+8]
5. (a) What are the hybrid or h parameters?. Why are they so called?
   (b) Draw the hybrid parameter equivalent circuit for an n-p-n common emitter transistor and briefly explain. [8+8]
6. (a) Draw the circuit diagram of a emitter follower circuit and derive expression of A_V and A_I using hybrid model.

(b) For a two stage cascade amplifier circuit shown below (figure6b). Calculate A_1 and A_V. Assume h_{ic}=1100r h_{rc}=1 h_{fe}=-51 h_{oc}=25μa/V [8+8]

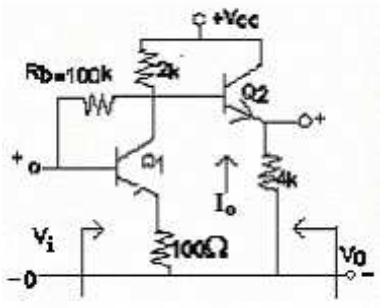

Figure 6b

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 types of oscillators based on frequency range.
   (c) Why RC oscillators are not suitable for high frequency applications. [8+4+4]

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Code No: RR10205 **Set No. 2**

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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 about diode switching times.
   (b) In the case of an open circuited p-n junction, the acceptor atom concentration is $2.5x10^{16}/m^3$ and donor atom concentration is $2.5x10^{22}/m^3$. Intrinsic concentration ni is $2.5x10^{19}/m^3$. Determine the value of contact difference of potential. [8+8]

3. (a) Calculate the percent ripple for the voltage developed across a $120 - \mu f$ filter capacitor when providing a load current of 80mA. The full wave rectifier operating from the 60 HZ supply develops a peak rectified voltage of 25V.
   (b) Design a CLC or π section filter for $V_{dc} = 10$V, $I_L = 200$mA and $\tau = 2\%$. [6+10]

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) Sketch the cross section of an NMOS enhancement transistor and briefly explain.
   (b) What is the significance of the threshold voltage V_T in
      i. enhancement mode

ii. depletion mode MOSFETS.

(c) Define R_d, g_m and μ of JFET. [6+4+6]

6. (a) Draw the circuit diagram of CE amplifier with emitter resistance and obtain its equivalent hybrid model and derive expressions for A_I, R_1, A_V use approximate analysis.

(b) Determine A_v, A_I, R_i, R_O for CE amplifier using n-p-n transistor with $h_{ie} = 1200\Omega \quad h_{re} = 0 \quad h_{fe} = 36 \quad h_{oe} = 2 \times 10^{-6} mho \quad R_L = 2.5k\Omega$ $R_S = 500\Omega$ (neglect the effect of biasing circuit) [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) Draw the circuit diagram of a RC phase 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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Code No: RR10205 **Set No. 3**

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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) With the help of necessary graphs and sketches explain the potential distribution in an open circuited p-n junction.
   (b) Explain about Forward bias and Reverse bias in the case of a p-n junction diode. [8+8]
3. (a) Explain the action of a full wave rectifier with centre tapped transformer and sketch the wave forms of input and output voltages.
   (b) Derive the expression for ripple factor in a full wave rectifier with resistive load.
   (c) Determine the value of ripple factor operating at 50 Hz with 100μF capacitor filter and 100 Ω load. [6+6+4]
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) 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 obtain expression for g_m.
   (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.
6. (a) Draw the circuit diagram of a self bias circuit and derive expression for S. Why it is widely used.
   (b) How to obtain quiescent point graphically for a given transistor amplifier of CE configuration explain. [10+6]

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7. (a) List out advantages and disadvantages of negative feedback.

   (b) The circuit parameters in 2-stage self-bias voltage series feedback amplifier are $R_S = 100\Omega$, $R_1 = 220K$, $R_2 = 22K$, $R_{c1} = 22K$, $R_{e1} = 100\Omega$, $R_{e2} = 4.7K$, $R_f = 10K$. The transistor h-parameters are $h_{ie} = 1100\Omega, h_{fe} = 100, h_{re} = h_{oe} = 0$. Neglect capacitances of all capacitors. Calculate $\beta, A_v, A_{vf}, R_{if}$ and R_{of}. [6+10]

8. (a) Why the LC oscillators are not suitable for low frequency applications. Explain the principle of working of basic LC oscillators.

   (b) Find C and h_{fe} of a transistor to provide f_o of 50KHZ of a RC phase shift oscillator. Given $R_1 = 22k\Omega$, $R_2 = 68k\Omega$, $R_c = 20k\Omega$, R=6.8kΩ and $h_{ie} = 2k\Omega$. [10+6]

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Code No: RR10205 **Set No. 4**

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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) Explain how voltage, current and frequency can be measured using CRO.
   (b) The electrons emitted from the thermianic cathode of a cathode ray gun are accelerated by a potential of 400V The essential dimensions are L = 19.4 CM, l = 1.27cm and d = 0.475 cm Determine deflection sensitivity. What must be the magnitude of a transverse magnetic field acting over the whole length of the tube in order to produce the same deflection as that produced by a deflection potential of 30V. [8+8]

2. (a) Draw the band diagram of PN junction under open circuit conditions and explain.
   (b) Sketch charge density, electric field intensity and potential energy biased for electrons and holes. [8+8]

3. (a) Calculate the percent ripple for the voltage developed across a $120-\mu f$ filter capacitor when providing a load current of 80mA. The full wave rectifier operating from the 60 HZ supply develops a peak rectified voltage of 25V.
   (b) Design a CLC or π section filter for $V_{dc} = 10$V, $I_L = 200$mA and $\tau = 2\%$. [6+10]

4. (a) Mention the typical transistor junction voltage values of $V_{CE}(sat), V_{BE}(sat)$, $V_{BE}(active)$ *and* $V_{BE}(cut-in)$ for Si and Ge.
   (b) Explain the delay time, rise time and storage time of a switching transistor.
   (c) What are h-parameters. Mention their advantages when used to represent a transistor. Find the h-parameters from the characteristics. [4+4+8]

5. Distinguish between n-channel and p-channel MOSFETs. What are the different types of MOSFETs? Sketch the structure of a p-channel enhancement MOSFET and explain its working. [16]

6. (a) Discuss the phenomena of thermal runaway .
   (b) What is meant by bias stabilization?
   (c) Derive the expression for stability factors S.

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(d) For the CC amplifier the transistor parameters are $h_{ic} = 1500$ $h_{fe} = -80$ $h_{oc} = 2 \times 10^{-5} mho$ $h_{rc} = 1$ Calculate input impedance Zi, ,Voltage gain AV and output impedance R_O. [4+4+4+4]

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) 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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