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

I B.Tech Supplementary Examinations, Apr/May 2006
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) Derive the expression for the electro static deflection sensitivity in the case of CRT.
   (b) Compare electro static and electro-magnetic deflection sensitivity in all respects. [8+8]
2. (a) Explain the term Transition capacitance C_T of a p-n junction diode.
   (b) Derive the expression for transition capacitance C_T of a diode. [6+10]
3. (a) Derive the expression for ripple factor in a full wave rectifier using an inductor filter.
   (b) Compare the performance of series inductor, L-Section and π - Section filters.
   (c) In a full wave rectifier using an LC - filter L=10 H, C=100μ F and R_L= 500Ω. Calculate I_{dc}, V_{dc}, for an input ν = 30sin (100πt). [6+6+4]
4. (a) Define α, β, γ of a transistor show have they are related to each other.
   (b) Define I_{CBO} and I_{CEO}. How are they different? How are they related? Are the typically close in magnitude? [8+8]
5. (a) Explain the need for bias stabilization.
   (b) What are the requirements of a biasing circuit? Explain?
   (c) Explain briefly about the simplest biasing circuit. [4+6+6]
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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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 transit time τ (tow) and final velocity V in the case of an electron traversing in uniform electric field E
   (b) An electron with a velocity of $3 \times 10^5 ms^{-1}$ enters an electric field of 910 v/m making an angle of 60^0 with the positive direction. The direction of the electric field is in the positive Y direction. Calculate the time required to reach its maximum height. [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) 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 900 Ω.If the diode resistance and the secondary coil resistance together has a resistance of 100 Ω, determine [6+10]
      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.

4. (a) Describe the two types of breakdowns in a transistor.
   (b) Why does the CE configuration provide large current amplification while CB does not?

(c) Why is the base of a transistor made thin and is lightly doped? [6+5+5]

5. (a) Distinguish between TRIAC , SCR and DIAC.

   (b) Draw the static characteristics of SCR for different gate currents and briefly explain? [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) Classify the amplifiers based as feedback topology and give their block diagram. How the input and output impendence are effected in each case.

   (b) Draw the circuit diagram of a current feed back circuit and derive Expressions for Voltage gain and output resistance, and input resistance. [8+8]

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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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) 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) What are three approximations of forward biased semiconductor diode. Explain, with neat sketches and equivalent circuits.
   (b) The expression for the breakdown voltage of a Zener diode is given as $V_z = E_z^2/2eNA$ with usual notation. Assuming that $N_A << N_D$, prove that the breakdown voltage for a Germanium Diode is $51\backslash\sigma_p$ if $E_Z = 2^*10^7 v/m$. [8+8]

3. (a) Calculate the value of capacitance to use in a capacitor filter connected to a full wave rectifier operating at a standard aircraft power frequency of 400HZ, if the ripple factor is 10% for a load of 500Ω.
   (b) Design a filter for full wave circuit with LC filter to provide an output voltage of 10V with a load current of 200mA and the ripple is limited to 2%. [6+10]

4. (a) Explain the mechanism of current flow in a PNP and NPN Transistor
   (b) In a transistor operating in active region, although the collector Junction is reverse - biased, the collector current is quite large Explain. [10+6]

5. (a) Briefly explain how FET can be used as an amplifier.
   (b) Draw a small signal equivalent circuit of a FET model and explain the significance of each element. [8+8]

6. (a) For the given circuit (as shown in figure1) find R_S,R_1 and R_2 for the given data β=50, V_{BE} =0,6V V_{CC}=22.5V,R_C=5.6K and it is desired to establish a Q point at V_{CE}=12V, I_C=12.5mA and stability factor S≤3.

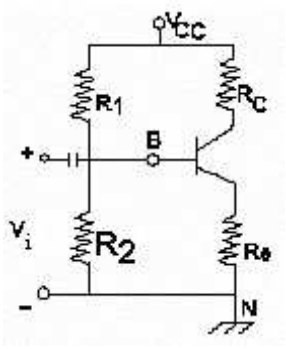

Figure 1:

(b) What is the role of R_e in the self bias circuit? [10+6]

7. (a) Classify various feedback amplifiers.

(b) For the two stage amplifier circuit (as shown in figure2), 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. $A_{vf} = \frac{V_o}{V_s}$.

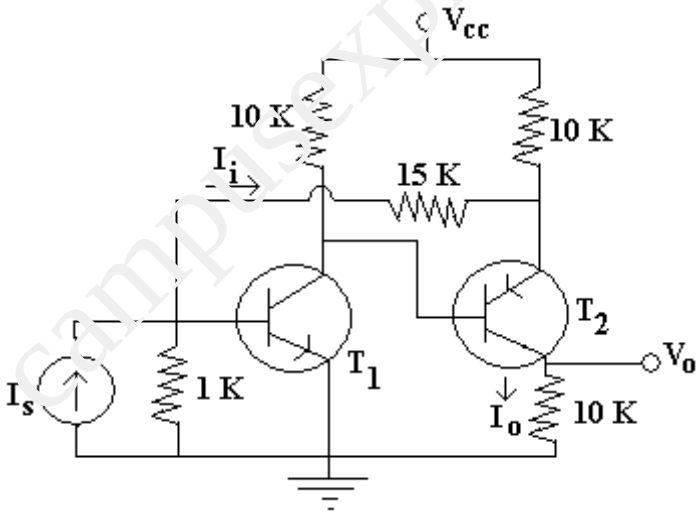

Figure 2:

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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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) Give the block diagram of CRO and explain about each block in detail?
   (b) In a electrostatic deflecting CRT the length of the deflection plats is 2cm, and spacing between deflecting is 0.5cm, The distance from the cenlve of the deflecting plate to the screen is 20cm, the deflecting voltage is 25V Find the deflecting sensitivity, the angle of diction and velocity of the beam. Assume final anode potential is 1000V [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) Derive the expression for ripple in a pi-section filter when used with a half wave rectifier.
   (b) A full-wave single phase rectifier employs a Π-section filter consisting of two $4\mu F$ capacitances and a 20H choke. The transformer voltage to the center tap is 300V rms. The load current is 500mA. Calculate the dc output voltage and the ripple voltage. The resistance of the choke is 200Ω. [8+8]

4. (a) A transistor operating in CB configuration has $I_c = 2.98$ mA, $I_E = 3.00$mA and $I_{CO} = 0.01$ mA what current will flow in the collector circuit of this transistor when connected in CE configuration with a base current of $30\mu A$.
   (b) The reverse saturation current in a transistor is $8\mu A$. If the transistor common base current gain is 0.979, calculate the collector and emitter current for $40\mu A$ base current. [8+8]

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 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 (figure1). Calculate A_1 and A_V. Assume h_{ic}=1100r h_{rc}=1 h_{fe}=-51 h_{oc}=25μa/V [8+8]

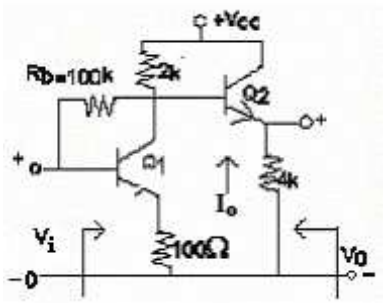

Figure 1:

7. (a) How do you classify feedback amplifier and what are they? Can you say that the feedback effects bandwidth of an amplifier? Justify your answer.

   (b) How the negative feedback effect on input and output resistances. Justify your statement with required derivations. [8+8]

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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