Code No: R05010204 **Set No. 1**

I B.Tech Regular Examinations, Apr/May 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) 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) What is Hall effect? Derive an expression for Hall coefficient? [8]
   (b) Calculate the conductivity of copper having density 8.9 gm/cm^3 and mobility $34.8cm^2$/v-sec. Atomic weight of copper is 63.57 while it has 1 valance electron per atom. Assume the value of M=1.66×10^{-27} kg. [8]

3. (a) Explain about the regulation characteristics of Zener diode with a circuit and waveforms. [8]
   (b) A full wave rectifier circuit uses two silicon diodes with a forward resistance of 20Ω each. A d.c. voltmeter connected across the load of 1kΩ reads 55.4 volts. Calculate
      i. T_{RMS}
      ii. Average voltage across each diode
      iii. ripple factor
      iv. Transformer secondary voltage rating. [8]

4. (a) Describe a set up to obtain the output characteristics of a transistor in CE configuration. Indicate the various regions of operation on the output characteristics. [8]
   (b) Explain the principle of MOSFET in depletion mode. With neat sketches and o/p characteristics. [8]

5. (a) What are the biasing schemes available to achieve the required bias in a junction
   field effect transistor. Explain any one of the biasing schemes.
   (b) For the circuit shown figure 5b, Find the values of V_{DS} and V_{GS}. Given I_D=5mA,

V_{DD}=10V, R_D=1KΩ, R_S=500Ω.

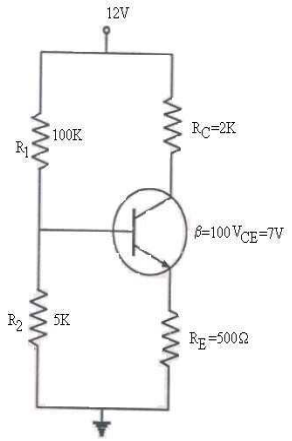

Figure 5b

6. (a) Draw the circuit diagram of RC coupled amplifier and obtain its frequency and phase response. 3+3+2]

   (b) A common source FET amplifier circuit shown in figure 6 with unbypassed R_S has the following circuit parameters: R_d = 15k, R_s = 0.5k, R_g = 1M, r_d = 5k, g_m= 5 m mho and V_{DD} = 20 V. Calculate A_V and R_O . [4+4]

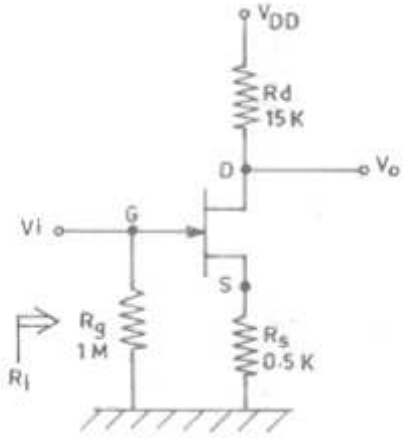

Figure 6

7. (a) State three fundamental assumptions which are made in order that the expression A_f =A/(1+$A\beta$) be satisfied exactly. [8]

   (b) An Amplifier has a value of R_{in}=4.2K, A_V=220 and β=0.01. Determine the value of input resistance of the feedback amplifier. [4]

   (c) The amplifier in part (a) had cut-off frequencies f_1=1.5KHz and f_2=501.5KHz before the feedback path was added. What are the new cut-off frequencies for the circuit? [4]

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

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

3. (a) Define the terms as referred to FWR circuit.
      i. PIV
      ii. average d.c. voltage
      iii. RMS current
      iv. ripple factor. [8]
   (b) A full wave rectifier (FWR) supplies a load requiring 300V at 200mA. Calculate the transformer secondary voltage for
      i. a capacitor inpur filter using a capacitor of 10 μF.
      ii. a choke input filter using a choke of 10 H and a capacitance of 10μF. Neglect the resistance of choke. [8+8]

4. (a) Draw the two transistor version of an SCR and explain its firing characteristics with this circuit. [8]
   (b) Explain the working principle of UJT with its characteristics. [8]

5. (a) Explain bias compensation using sensistors. [6]

(b) In the circuit shown, if I_C=2mA and V_{CE}=3V. Calculate R_1 and R_3. (figure 5) [10]

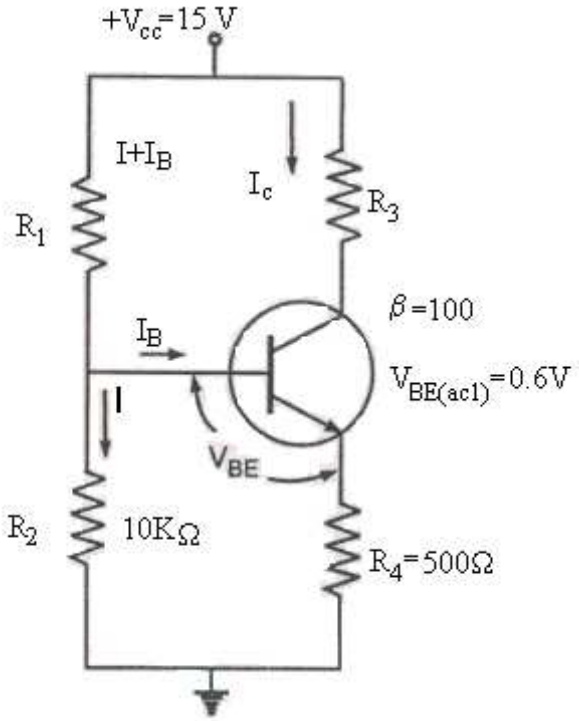

Figure 5

6. (a) Draw the CE amplifier with unbypassed R_E and derive the expressions for voltage gain and current gain. [3+5]

(b) The figure (figure 6) is a swamped FET amplifier. Determine the voltage gain when R_L=100KΩ. Neglect the FET output resistance (r_d) Take g_m = 4 mS. [8]

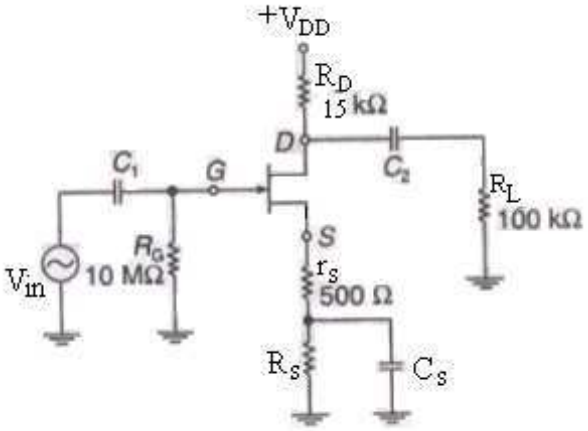

Figure 6

7. (a) Explain with circuit diagram a negative feedback amplifier and obtain expressions for its closed loop gain. [4+4]

(b) The gain of an amplifier is decreased to 1000 with negative feedback from its gain of 5000. Calculate the feedback factor and the amount of negative feedback in dB. [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: R05010204 **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) 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 do you understand by depetion region at p-n junction? What is the effect of forward and reverse biasing of p-n junction on the depletion region? Explain with necessary diagrams.
   (b) Explain the concept of tunneling with energy band diagrams. [8]

3. (a) Define the terms as referred to FWR circuit.
      i. PIV
      ii. average d.c. voltage
      iii. RMS current
      iv. ripple factor. [8]
   (b) A full wave rectifier (FWR) supplies a load requiring 300V at 200mA. Calculate the transformer secondary voltage for
      i. a capacitor inpur filter using a capacitor of 10 μF.
      ii. a choke input filter using a choke of 10 H and a capacitance of 10μF. Neglect the resistance of choke. [8+8]

4. (a) What is early effect? How does it modify the V-I characteristics of a BJT. [6]
   (b) Define α_{dc} and β_{dc} of a transistor. Derive the relation between them. [6]
   (c) Give reason for cut off conditions for Si and Ge transistors are different. [4]

5. (a) Explain in detail about thermal runaway and thermal resistance.

(b) For the circuit shown figure 5b, determine I_E, $V_C$and V_{CE} . Assume V_{BE}=0.7V [8+8]

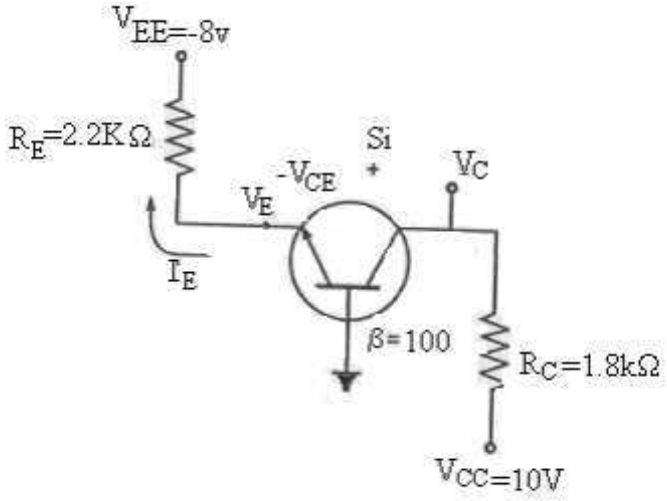

Figure 5b

6. (a) Draw the common base circuit and derive the expressions for voltage gain and current gain. [3+5]

   (b) The figure 6 shows the circuit of a common gate JFET amplifier. The JFET has gm=2500μS. Determine the voltage gain and input resistance. [4+4]

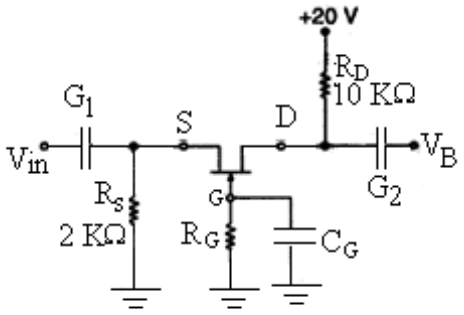

Figure 6

7. (a) What are the different types of negative feedback? Briefly explain how the input and output impedances of an amplifier are affected by the different types of negative feedback. [4+4]

   (b) An Amplifier has voltage gain with feedback is 100. If the gain without feedback changes by 20% and the gain with feedback should not vary more than 2%. Determine the values of the open loop gain A and feedback ratio β. [4+4]

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) What do you understand by depetion region at p-n junction? What is the effect of forward and reverse biasing of p-n junction on the depletion region? Explain with necessary diagrams.
   (b) Explain the concept of tunneling with energy band diagrams. [8]

3. (a) Draw the circuit diagram of full-wave rectifier with inductor filter.
   (b) A full-wave rectified voltage of 18V peak is applied across a 500μF filter capacitor. Calculate the ripple and d.c. voltages if the load takes a current of 100mA. [8+8]

4. (a) With neat diagram explain the various components in an pmp transistor. [8]
   (b) Explain the input and output characteristics of a transistor in CB configuration. [8]

5. (a) Explain bias compensation using sensistors. [6]
   (b) In the circuit shown, if I_C=2mA and V_{CE}=3V. Calculate R_1 and R_3. (figure 5) [10]

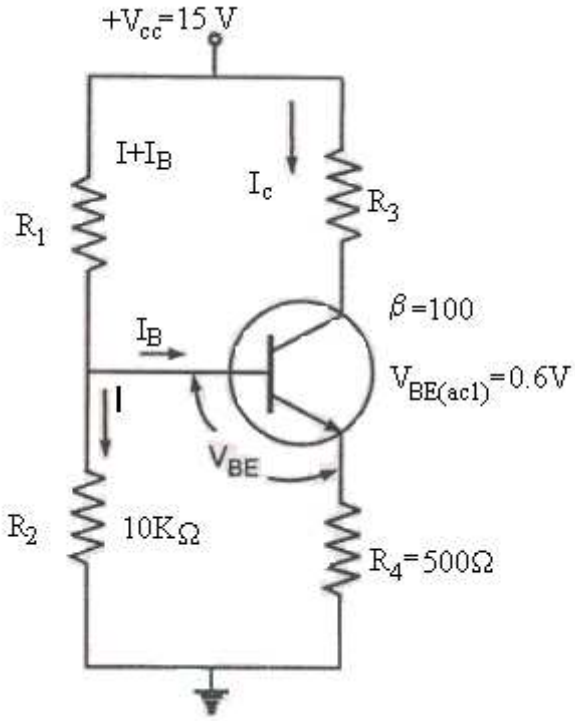

Figure 5

6. (a) Draw the high frequency small signal model of a transistor in CE configuration and explain significance of each component. [3+5]

   (b) A transistor with h_{ie}=1.1K, h_{fe}=50, h_{re}=205X10^{-4} , h_{oe}=25μA/V is connected in CE configuration as shown in figure 6. Calculate A_I, A_V, R_I, R_0. [2+2+2+2]

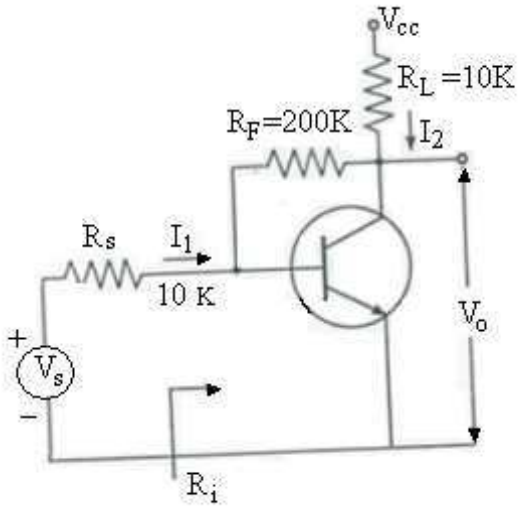

Figure 6

7. (a) Define Desensitivity. [3]

   (b) For large values of D, what is A_f? What is the significance of this result? [5]

(c) An Amplifier has a mid-frequency gain of 100 and a bandwidth of 200KHz. [8]

i. What will be the new bandwidth and gain if 5% negative feedback is introduced?

ii. What should be the amount of negative feedback if the bandwidth is to be restricted to 1MHz?

8. (a) What is piezoelectric effect? Explain the working of crystal oscillator.

(b) A crystal oscillator has L=0.4H, C=0.085PF and Mounting capacitance C_M=1PF with R=5kΩ. Find series and parallel resonant frequencies. By what percent does the parallel resonant frequency exceed the series resonant frequency? Also find the Q-factor of the crystal. [8+8]

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