Code No: R21026 **R10** SET - 1

II B. Tech I Semester, Regular Examinations, Nov – 2012
ELECTRONIC DEVICES AND CIRCUITS
(Com. to EEE, ECE, EIE, ECC, CSE, IT, BME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Trace the path of an electron in perpendicular electric and magnetic fields.
   b) In a CRT, a pair of deflecting plates is spaced 1cm apart and the virtual cathode is observed at 2cm from the starting point of deflecting plates. The distance from the centre of plates to the screen is 48cm. Calculate
   i) Deflection produced by deflecting voltage of 60V
   ii) Angle which the beam makes with the axis of the tube on emerging from the field, if the final anode voltage is 2000 V. (9M+6M)

2. a) Show that the Fermi energy level lies in the centre of forbidden energy band for an intrinsic semiconductor.
   b) Find the concentration of holes and electrons in a p-type Silicon at 300K assuming resistivity as 0.02Ω-cm. Assume μ_p=475m^2/V-sec, n_i=1.45*10^{10}/cm^3 (10M+5M)

3. a) What is Tunnel diode? Explain its characteristics with the help of energy band diagrams
   b) Explain about construction of LED and its voltage drop and current with necessary diagrams. (10M+5M)

4. A voltage of 500 cos wt is applied to Half Wave Rectifier with load resistance of 5KΩ Define and derive the values of Maximum DC Voltage component, R.M.S. current, Ripple Factor, Transformer Utilization Factor, PIV and Rectifier Efficiency of the rectifier. (15M)

5. a) What is a transistor? Explain about its operation.
   b) Derive Emitter Efficiency, Transport factor and large signal current gain and derive the relation between them. c) Explain how transistor works as an amplifier (4M+7M+4M)

6. a) Draw the circuit diagram of Common Drain amplifier and derive expressions for voltage gain and input resistance.
   b) What are the values of I_D and g_m for V_{GS} = -1.5V if I_{DSS} and V_P are given as 8.4mA and – 3V respectively. (9M+6M)

7. a) Explain the need of biasing and stabilization.
   b) If the various parameters of a CE amplifier which uses the self bias method are V_{CC}=12V, R_1=10KΩ, R_2=5KΩ, R_C=1KΩ, R_e=2KΩ and β=100, find
   i) The coordinates of the operating point and
   ii) The stability factor, assuming the transistor to be of silicon. (3M+12M)

8. Derive the expressions for voltage gain, current gain, input impedance, output impedance of CE amplifier, using exact and approximate model. (15M)
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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
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1. a) An electron is moving perpendicular to magnetic field (B). Analyze the trajectory of electron and derive expression for Radius (R) of trajectory and period of rotation (T).
   b) An electron having initial velocity corresponding to 300V is projected perpendicularly into a uniform magnetic field of intensity 10^{-3}Wb/m^2. Find
      i) Radius of path of one revolution
      ii) Time taken for one revolution (9M+6M)

2. If the electron is accelerated at an angle of 40^0.
   a) What is Hall Effect? Derive an expression for Mobility (μ).
   b) An n-type Si bar whose resistivity is 1000Ω-m and width 1cm is used in Hall Effect experiment. If the current in the bar is 10μA and Hall voltage is 40mV. Find the mobility if the applied magnetic field is of intensity 0.3077Wb/m^2 and also find out the Hall Coefficient. (9M+6M)

3. a) Compare the characteristics of PN junction diode, Zener Diode and Tunnel diode.
   b) Explain Law of Junction.
   c) For a Ge diode, the I_0=2μA and the voltage of 0.26V is applied. Calculate the forward and reverse dynamic resistance values at room temperature. (6M+5M+4M)

4. a) Explain the operation of Full Wave Rectifier with necessary graphs.
   b) A 3KΩ resistive load is to be supplied with a D.C. voltage of 300V from A.C. voltage of adequate magnitude and 50Hz frequency by wave rectification. The LC filter is used along the rectifier. Design the bleeder resistance, turns ratio of transformer, VA rating of transformer and PIV rating of diodes. (7M+8M)

5. a) Explain the operation of CB Configuration of BJT and its input and output Characteristics briefly
   b) A transistor with α=0.97 has a reverse saturation current of 1μA in CB configuration.
   Calculate the value of leakage current in the CE configuration. Also find the collector current and the emitter current if the value of base current is 20μA. (7M+8M)

6. a) Why we call FET as a Voltage Controlled Device.
   b) Define DC Drain resistance, AC Drain Resistance, Amplification Factor and derive them. (5M+10M)

7. a) What is Biasing? Explain the need of it. List out different types of biasing methods
   b) In a Silicon transistor circuit with a fixed bias, V_{CC}=9V, R_C=3KΩ, R_B=8KΩ,β=50,V_{BE}=0.7V. Find the operating point and Stability factor. (7M+8M)

8. a) Analyze a Single stage transistor amplifier using h-parameters.
   b) Give the approximate h-parameter conversion formulae for CC and CB configuration in terms of CE. (7M+8M)
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Code No: R21026 **R10** SET - 3

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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
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1. a) Describe the two dimensional motion of an electron in perpendicular electric and magnetic fields
   b) In a CRT, a pair of deflecting plates is spaced 0.5cm apart and the distance from origin of plates to screen is 25cm. The distance from the centre of plates to the screen is 24cm. The final anode voltage is 1000V. Calculate i) Deflection produced by deflecting voltage of 30V ii) Angle which the beam makes with the axis of the tube on emerging from the field. (9M+6M)

2. a) Explain about the carrier concentration and Fermi level in intrinsic semiconductors. Also derive the number of electrons and holes present in it.
   b) The Hall Effect is used to determine the mobility of holes in a p-type silicon bar. Assume the bar resistivity is 2, 00,000Ω-cm, the magnetic field intensity is 0.1Wb/m^2 and the width is 3mm. the measured values of the current and Hall voltage are 10mA and 50mV respectively. Find the mobility of holes. (10M+5M)

3. a) Explain about current components of a PN junction diode.
   b) Explain V-I characteristics and Temperature dependence of characteristics.
   c) Explain Einstein's relation and find out the diffusion constant of holes if their mobility is given as 0.039m^2/v-sec. (4M+7M+4M)

4. a) Explain the operation of Full Wave Rectifier with Induction filter with necessary diagrams.
   b) A diode whose internal resistance is 20Ω is to supply power to a 100Ω load from 110V (R.M.S) source of supply. Calculate i) Peak Load Current ii) DC Load Current iii) AC Load Current iv) % Regulation from No load to given load (7M+8M)

5. a) What is Transistor? Explain operation of a Transistor in CE configuration.
   b) In which configuration we find Base width modulation? Explain about it.
   c) If a transistor, with α=0.96 and emitter to base resistance 80 Ω is placed in Common Emitter Configuration. Find A_I, A_V and A_P (6M+4M+5M)

6. a) Explain the working principle of UJT with its characteristics.
   b) For the Common Source Amplifier, calculate the value of the voltage gain, given
      i) r_d=100KΩ, R_L=10KΩ, g_m=300μ and R_O=9.09KΩ.
      ii) If C_{DS}=3pF, determine the output impedance at a signal frequency of 1MHz. (8M+7M)

7. a) What is the necessity of biasing circuits? Derive the expression for stability factor of self bias circuit
   b) Explain in detail about Thermal Runaway and Thermal Resistance. (8M+7M)

8. a) Give disadvantages of h-parameter analysis.
   b) Give the approximate h-parameter conversion formulae for CB and CE configuration in terms of CC.
   c) Compare A_V, A_I, R_i and R_o of CE, CB and CC configurations (3M+8M+4M)
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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
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1. a) Derive an expression for magneto static deflection sensitivity in the case of CRT.
   b) An electron moving with a velocity of 10^7m/sec enters a uniform magnetic field at an angle of 30^0 with it. Calculate the magnetic flux density required in order that the radius of helical path is 2m. Also calculate the time taken by the electron for one revolution. (9M+6M)

2. a) Discuss Continuity Equation.
   b) Calculate the intrinsic concentration of Germanium in carriers/m^3 at a temperature of 320^0K given that ionization energy is 0.75eV and Boltzmann's constant K=$1.374*10^{-23}$J/^{0}K. Also calculate the intrinsic conductivity given that the motilities' of electrons and holes in pure germanium are 0.36 and 0.17m^2/volt-sec respectively (9M+6M)

3. a) Derive an expression for transition capacitance.
   b) Explain Avalanche and Zener Breakdowns.
   c) Explain about PIN and Photo diodes. (7M+4M+4M)

4. a) Derive the expression for Ripple factor for Full Wave Rectifier with L-Section filter. Explain the necessity of a bleeder resistor.
   b) A sinusoidal voltage whose V_m=24V is applied to half-wave rectifier. The diode may be considered to be ideal and R_L=1.8KΩ is connected as load. Find out peak value of current, RMS value of Current, DC value of current and Ripple factor. (7M+8M)

5. a) Explain the operation of CC Configuration of BJT and its input and output characteristics briefly
   b) Explain about Punch through and Base width modulation. (7M+8M)

6. a) Draw the FET tree and draw circuit symbols for all types of FET.
   b) Why we call FET as a Voltage Controlled Device.
   c) What are the values of I_D and g_m for V_{GS} = -0.8V if I_{DSS} and V_P are given as 12.4mA and -6V respectively. (6M+4M+5M)

7. a) What is the need of biasing?
   b) In a Self bias circuit containing R_1=80KΩ, R_2=25KΩ, R_e=2KΩ, R_C=2KΩ, β=100, V_{CC}=12V, V_{BE}=0.7V. Find the operating point, S and S'. (3M+12M)

8. a) Give the advantages of h-parameter analysis.
   b) The h-parameters of a transistor used in a CE circuit are h_{ie}=1KΩ, h_{re}=0.001. h_{fe}=50, h_{oe}=100K. The load resistance for the transistor is 1KΩ in the collector circuit. Determine R_i, R_O, A_V, A_i in the amplifier stage (Assume R_s= 1KΩ) (3M+12M)
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