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

II B. Tech I Semester, Supplementary Examinations, May – 2013
ELECTRONIC DEVICES AND CIRCUITS
(Com. to ECE, EEE, 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) Derive an expression for magnetic deflection sensitivity.
   b) A voltage of 15V is applied to pair of deflection plates which are 3cm long and 0.5cm apart. The CRT screen is located 25cm from the centre of plates. Calculate the deflection produced by the deflection plates when an anode voltage of 200V is applied. Find the velocity of electron flowing in the electric field and also find the acceleration of electron to the electric field?

2. a) The Fermi energy level of a n-type semiconductor lies 0.5 ev below the conduction band at 3000^0 K. If temperature of the semiconductor is raised to 3600^0 K, what is the value of new Fermi energy level.
   b) Derive the expression for minority diffusion current.
   c) Explain the significance of continuity equation.
   d) What is Hall effect?

3. a) Explain the space charge density distribution in p-n junction diode with suitable diagram.
   b) What are the effects of temperature on p-n junction?
   c) Draw the volt-ampere characteristics of Tunnel diode and how it differ from p-n junction diode?

4. a) Calculate the value of the capacitor connected to a half wave rectifier to permit only 5% of ripple. The rectifier circuit is connected to a source of 220V and load of 500Ω/watt.
   b) Derive the expression for ripple factor of bridge full wave rectifier with capacitor filter.
   c) What are the advantages of a center tapped full wave rectifier over half wave rectifier?

5. a) Draw the Circuit diagram of CE configuration and explain its operation with input and Output characteristics.
   b) Explain the principle of working of photo transistor.

6. a) Explain the construction and working of n-channel JFET.
   b) Draw the two transistor equivalent circuit of SCR and explain its principle of working.

7. a) What is the need for biasing? What are the factors affecting the Q-point in BJT?
   b) Explain how diode is used to compensate the variation in base-emitter voltage?
   c) What is thermal runaway? What are the factors that influence the thermal resistance?

8. a) Derive an expression for current gain with and without source resistance for CB configuration.
   b) What are the advantages of h-parameter model?
   c) Define h_{ic} and derive its expression in terms of h_{ie}.
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Code No: R21026 **R10** SET - 2

II B. Tech I Semester, Supplementary Examinations, May – 2013
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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Two parallel plates are kept a distance 1 cm apart. One plate is 600V positive with respect to the other. An electron starts from rest from the negative plate. Find the distance traveled by the electron when it has acquired a speed of $5x10^6$ m/s. At this instant the potential across the plate is suddenly removed. Find the total time of travel of the electron from the negative plate to positive plate.
   b) Draw the block diagram of CRO and explain the function of each block.

2. a) Find the electron concentration in p-type semiconductor when the Acceptor concentration is $5x10^{14}cm^{-3}$ and intrinsic value of Germanium material at 300^0K is $2.5x1013cm^{-3}$.
   b) Derive expression for majority diffusion current.
   c) Explain the generation and recombination of charge carriers in a semiconductor and derive an expression for them

3. a) Explain how barrier potential is developed at the p-n junction?
   b) Draw the volt-ampere characteristics of a diode and explain.
   c) Draw the equivalent circuit of Varactor diode. What are the applications of it?

4. a) An ac supply of 230V is applied to a HWR through a turn's ratio of 4:1. Assume R_f=0Ω, R_L=300Ω. Find the ϒ, η, TUF, PF, PIV?
   b) Explain how zener diode is used as voltage regulator and explain its working with neat diagram.

5. a) Draw the circuit diagram of CB transistor configuration and explain its operation with input and output characteristics.
   b) Explain how transistor works as an amplifier?

6. a) Derive an expression for trans-conductance in terms of pinch-off voltage and gate-source voltage.
   b) What are the advantages of MOSFET over JFET?
   c) Draw the volt-ampere characteristics of UJT and explain how negative resistance region occur?

7. a) Design a collector-bias circuit for the following specification V_{CC}=10V, V_{BE}=0.7V, I_C=2mA, h_{fe}=200.
   b) Explain transistorized bias compensation against variation in reverse saturation voltage.
   c) Derive the expression for the condition to avoid thermal runaway.

8. a) Convert the h-parameters of common emitter configuration to common base configuration.
   b) Derive an expression for voltage gain with and without source resistance for common-collector amplifier.

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Code No: R21026 **R10** SET - 3

II B. Tech I Semester, Supplementary Examinations, May – 2013
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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) A charged particle having charge 4 times that of an electron and mass 3 times that of an electron is accelerated through a potential difference of 60V before it enters an uniform magnetic field of flux density $0.25Wb/m^2$ at an angle of 30^0 with the field. Find: i) velocity of charge particle before entering the field ii) time of one revolution iii) Radius of helical path.
   b) Derive an expression for electrostatic deflection sensitivity

2. a) Find the conductivity of silicon atom when the donor impurity of 1 in 108 is applied. The intrinsic value of silicon atom is $1.5x10^{10}cm^{-3}$ at 300^0K. The mobility of the electrons and holes are $1300cm^2/v\text{-}s$ and $500cm^2/v\text{-}s$ respectively. The number of silicon atoms is $5x10^{25}cm^{-3}$.
   b) Derive an expression for minority drift current.
   c) Show that the minority carrier concentration is the sum of thermally generated carrier concentration and injected minority carrier concentration.

3. a) Explain how a diffusion and drift current flows in pn-junction diode?
   b) What is diffusion capacitance in pn-junction diode? Derive its equation.
   c) Explain the operation of Tunnel diode using energy band diagram.

4. a) A FWR has a center-tapped of 100-0-100V and each diode is rated at I_{max}=400mA, I_{avg}=150mA. Neglecting diode drop. Find R_L, which gives maximum DC power output, V_{dc}, I_{dc} and PIV.
   b) Draw the circuit diagram of shunt voltage regulator and explain its operation and also compare it with series voltage regulator.

5. a) Draw the circuit diagram of CC transistor configuration and explain its working with the help of input and output characteristics.
   b) Why transistor is called current controlled device?

6. a) Explain the working of n-channel enhancement MOSFET.
   b) Draw the equivalent circuit of UJT and derive the equation for intrinsic stand-off ratio.

7. a) Design a self bias circuit for a silicon transistor having β=50, assume V_{CE}=10V, R_c=3.5KΩ and S=10. The operating point has to be set at 4.5V and 1.2mA.
   b) Determine the parameters that decide the Q-point of the transistor bias circuit.
   c) Derive an expression for thermal stability.

8. a) Draw the h-parameter model for common base configuration and derive the equations for voltage gain, current gain, input and output impedance.
   b) Find h_{ic}, h_{ib} in terms of h_{ie}.

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Code No: R21026 **R10** SET - 4

II B. Tech I Semester, Supplementary Examinations, May – 2013
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Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
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1. a) Explain the behavior of an electron moving in a concurrent electro-magnetic fields, which are perpendicular to each other.
   b) In a electrostatic deflecting CRT, the length of the deflection plates is 2cm and spacing between deflecting plates is 0.5cm. The distance from the center of the deflecting plane to the screen is 20cm, the deflecting voltage is 25V. Find the deflection sensitivity, the angle of defection and velocity of the beam. Assume final anode potential is 1000V.

2. a) Find the resistivity of Germanium atom when the mobility of electrons and holes are $3800cm^2/V\text{-}s$ and $1800cm^3/V\text{-}s$ respectively. The intrinsic value of germanium atom is $2.5x10^{13}cm^3$ at 300^0K. The Germanium atom concentrations are $5x10^{20}cm^3$ respectively.
   b) Derive an expression for majority drift current.
   c) What are the applications of Hall Effect?
   d) What is meant by low level injection?

3. a) Explain the electric field distribution in pn-junction diode.
   b) Define the static and dynamic resistance of diode.
   c) Draw the volt-ampere characteristics of zener diode and explain how negative resistance region is obtained?

4. a) Define the following terms with respect to rectifiers.
   i) form factor ii) TUF iii) PIV iv) Peak factor
   b) Explain the operation of full-wave rectifier with and without L filter and derive the equation for ripple in both cases.

5. a) Draw the Ebers-Moll model of a BJT and derive an expression for collector and emitter currents.
   b) Compare all the three configurations of transistor.

6. a) Draw the transfer characteristics of n-channel enhancement type MOSFET and explain its working.
   b) What is the reason for negative resistance region in UJT?
   c) What are the applications of SCR?

7. a) Design a fixed biasing circuit with emitter resistor for the following specifications. V_{cc}=12V, V_{BE}=0.7V I_c=4mA and h_{fe}=250.
   b) What are the drawbacks of diode compensation technique? How to overcome them?
   c) Derive an expression for stability factor for self-bias circuit with emitter resistor.

8. a) Draw the h-parameter model for common-emitter configuration and derive the equations form A_V, A_I, R_i and R_0.
   b) The hybrid parameters of a transistor in the CB configuration with V_{CB}=10V and I_C=1mA are h_{fb} = -0.98, h_{ib}=20Ω, h_{rb} = 5 x 10^{-4}, and h_{ob}=10^{-7} mhos. Calculate the current gain, voltage gain, input impedance for a load R_L=10KΩ.

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