Code No: 07A10401 **Set No. 1**

**I B.Tech Regular Examinations, May/Jun 2008**
**BASIC ELECTRONIC DEVICES AND CIRCUITS**
**(Electrical & Electronic Engineering)**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

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 4 cms. An electron is at rest initally 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:
      i. The speed of electron in 40 n sec
      ii. The distance traversed by the electron in 40 n sec. [8+8]

2. (a) What are the various applications of p-n junction diode? Explain them.
   (b) What are the specifications of p-n junction diode? Explain how reverse saturation current varies with temperature both in Si and Ge diodes.
   (c) Explain about the characteristics of zener diode. [5+6+5]

3. (a) A 15-0-15 Volts (rms) ideal transformer is used with a full wave rectifier circuit with diodes having forward drop of 1 volt. The load is a resistance of 100ohm and a capacitor of 10,000$\mu$f is used as a filter across the load resistance. Calculate the dc load current and voltage.
   (b) Explain the working of the Half wave rectifier circuit with neat sketch of waveforms at various points in the circuit. [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) Compare the advantages and disadvantages of biasing schemes.
   (b) Calculate the quiescent current and voltage of collector to base bias arrangement using the following data:
   $V_{cc}$ =10V, $R_b$=100K$\Omega$, $R_c$=2K$\Omega$, $\beta$=50 and also specify a value of $R_b$ so that $V_{ce}$=7V. [8+8]

6. (a) A transistor used in CB circuit has the following set of h parameters, $h_{ib}$=20$\Omega$, $h_{fb}$=0.98, $h_{rb}$=$3\times10^{-4}$, $h_{ob}$= $0.5\times10^{-6}$. Find the values of $R_i$, $R_o$, $A_i$ and $A_v$ if $R_s$ =600$\Omega$ and $R_L$=1.5K$\Omega$.

(b) Draw the small signal hybrid model of CE amplifier and derive the expressions for its $A_i$, $A_v$, $R_i$ and $R_o$. [8+8]

7. (a) The output impedance may be calculated as the ratio of the open circuit voltage to the short circuit current. Using this method evaluate output resistance with feedback $R_{of}$ for a current-series feedback amplifier.

   (b) Draw an emitter follower circuit diagram and find the feedback factor and the input resistance with feed back. [8+8]

8. (a) Prove that the frequency stability improves as $d\theta/dw$ increases in oscillators.

   (b) Draw the FET crystal oscillator and derive the equation for frequency of oscillations. [8+8]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A10401 **Set No. 2**

**I B.Tech Regular Examinations, May/Jun 2008**
**BASIC ELECTRONIC DEVICES AND CIRCUITS**
**(Electrical & Electronic Engineering)**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

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 hte CRT. [8+8]

2. (a) How does the reverse sturation current of diode varies with temperature. Explain.
   (b) Draw the energy band diagram of p-n diode for no bias, forward bias and reverse bias and explain. [6+10]

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 900Ω. If the diode resistance and the secondary coil resistance together has a resistance of 100Ω, determine:
      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. [6+10]

4. (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 $\mu$.
   (b) From the definition of $g_m$ and $r_d$ obtain expression for $\mu$.
   (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. [5+5+6]

5. (a) Prove that stability factor $S'' = \frac{(I_{C1}-I_{CO1})S_2}{\beta_1(\beta_2+1)}$ where $S_2$ is the value of stabilizing factor S when $\beta = \beta_2$
   (b) Draw a circuit employing a sensistor compensation and explain its working. [8+8]

6. (a) Draw the equivalent circuit for the CE and CC configurations subject to the restriction that $R_L$=0. Show that the input impedance of the two circuits are identical.

   (b) For any single-transistor amplifier prove that $R_i = \frac{h_i}{1-h_r A_v}$. [8+8]

7. (a) An amplifier has a gain of -100 and a distortion of 8%. What is the effect of introducing negative feedback with feedback factor of 0.05?

   (b) Find $A_f$ for a CE stage with an un bypassed emitter resistor. [8+8]

8. (a) Draw the circuit diagram of a transistor phase-shift oscillator and discuss its operation. Obtain an expression for its frequency of oscillation.

   (b) What is the range of frequencies over which a crystal oscillator may be normally used and why? [8+8]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A10401 **Set No. 3**

**I B.Tech Regular Examinations, May/Jun 2008**
**BASIC ELECTRONIC DEVICES AND CIRCUITS**
**(Electrical & Electronic Engineering)**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

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) Two parallel plates of a capacitor are separated by 4 cms. 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. [8+8]
2. (a) Draw the basic structure of a varactor diode and explain its characteristics.
   (b) Write the diode equation and discuss the effect of temperature on diode current. [8+8]
3. (a) Draw the block diagram of a regulated power supply and explain its operation.
   (b) Define line regulation and load regulation. Give their typical numerical values. [8+8]
4. (a) Draw the circuit and explain the characteristics of BJT (input and output characteristics) in C.E. configuration.
   (b) Give the specifications, parameters and typical values of a silicon NPN transistor. [8+8]
5. (a) Differentiate bias stabilization and compensation techniques.
   (b) Design a voltage divider bias network using a supply of 24V, $\beta$=110 and $I_{CQ}$=4$\mu$A, $V_{ceQ}$=8V choose $V_e$=$V_{cc}$/8. [7+9]
6. (a) Draw the small signal hybrid model of CB amplifier and derive the expressions for its $A_i$, $A_v$, $R_i$ and $R_o$.
   (b) A transistor used in CE amplifier connection has the following set of h parameters, $h_{ie}$=1K$\Omega$, $h_{fe}$=100, $h_{re}$=5$\times 10^{-4}$, $h_{oe}$= 2$\times 10^{-5}$ $\Omega^{-1}$ $R_s$=15K$\Omega$, $R_L$=5k$\Omega$. Determine input impedance, output impedance, current gain and voltage gain. [8+8]
7. (a) An amplifier has a gain of -100 and a distortion of 8%. What is the effect of introducing negative feedback with feedback factor of 0.05?
   (b) Find $A_f$ for a CE stage with an un bypassed emitter resistor. [8+8]
8. (a) What is condition of unity loop gain to sustain oscillations? Prove it.
   (b) Prove that the ratio of the parallel to series resonant frequencies of a crystal is 1+1/2(C/C'). [8+8]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A10401 **Set No. 4**

**I B.Tech Regular Examinations, May/Jun 2008**
**BASIC ELECTRONIC DEVICES AND CIRCUITS**
**(Electrical & Electronic Engineering)**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Draw the schematic diagram of a CRT and explain about the various sections and the materials used.
   (b) In a CRT, the electrons emitted are accelerated by a potential of 500V. The length of the deflecting plates is 1.3 cm. Distance between the deflecting plates is 0.5 cm. The distance between the centre of the deflecting plates and the screen is 20 cm. Determine the value of electrostatic deflection sensitivity. [8+8]

2. (a) Draw the basic structure of a varactor diode and explain its characteristics.
   (b) Write the diode equation and discuss the effect of temperature on diode current. [8+8]

3. (a) Discuss the operation of HW recitifier with and without capacitor filter.
   (b) Draw the Half wave rectifier circuit using a step down Transformer with $V_s$ = 46 sin(100$\pi$ t) and a semiconductor diode. Calculate the turns ratio of the Transformer windings when the primary voltage of the Transformer is 230 volts. [8+8]

4. (a) Give the UJT symbol and simplified equivalent circuit with external resistors included.
   (b) Draw UJT emitter characteristics and mention various regions.
   (c) If $V_E$<$V_P$ and $V_E$>$V_P$, explain how UJT works for these conditions.[6+5+5]

5. (a) What is the necessity to stabilize the operating point of transistor amplifier?
   (b) What is thermal runaway?
   (c) For a fixed bias configuration determine $I_c$, $R_c$, $R_b$ and $V_{ce}$ using the following specifications: $V_{cc}$=12V, $V_c$=6V, $\beta$ =80, $I_b$ = 40 $\mu$A. [4+4+8]

6. (a) For a CB configuration, what is the maximum value of $R_L$ for which $R_i$ does not exceed 50$\Omega$? Transistor parameters are $h_{ib}$=21.6$\Omega$, $h_{rb} = 2.9\times10^{-4}$, $h_{fb}$=-0.98 and $h_{ob}$=0.49$\mu$ A/V.
   (b) Sketch the circuit of a CD amplifier. Derive the expression for the voltage gain at low frequencies and what is the order of magnitude of the output impedance. [8+8]

7. (a) Draw a feedback amplifier in block-diagram form. Identify each block and state its funcetion.

(b) An amplifier has a voltage gain of -100. The feedback ratio if 0.01. Find the voltage gain with feedback, the output voltage of the feedback amplifier for an input voltage of 1mv, feedback factor, and feedback voltage? [8+8]

8. (a) Prove that the frequency stability improves as $d\theta/dw$ increases in oscillators.

(b) Draw the FET crystal oscillator and derive the equation for frequency of oscillations. [8+8]

⋆ ⋆ ⋆ ⋆ ⋆