Course Code & Course Name : 23Eb202/ ELECTRO DEVICES AND CIRCUITS

Year/Sem : II/III

Unit-I: Applications of Semiconductor Devices

Part-A (2 Marks)

1. Differentiate between zener breakdown and avalanche breakdown.
2. What is meant by diffusion current in a semi conductor?
3. Elucidate ripple factor and TUF.
4. Define transition capacitance and mention the mathematical expression for it.
5. Write the equation for diode current under reverse bias.
6. Define Knee voltage & peak inverse voltage in a diode.
7. What is depletion region in PN junction?
8. Explain barrier potential.
9. State the principle of operation of an LED & Give the advantages of LED.
10. Give the effect of Temperature on PN Junction diode?

Part B (16 Marks)

1. Draw the circuit diagram and explain the operation of full wave rectifier using center tap transformer and using bridge rectifier without center tap transformer.
   (i) Dc output voltage
   (ii) dc output current
   (iii) RMS output voltage. (16)
2. (i)Explicate the working of LCD seven segment displays using square wave supply. (8)
   (ii)With a neat diagram explain the working of a PN junction diode in forward bias and reverse bias. (8)
3. (i) Explain V-I characteristics of Zener diode. (8)
   (ii) Explain the VI characteristics of PN diode and the current components of it. (8)

4. (i)Draw the output voltage waveform of a half wave rectifier and then show the effect on this waveform by connecting a capacitor across the load resistance. (8)

   (ii)Explain the bridge rectifier circuits with waveforms. (8)

5. (i)Explain the working of a Zener diode as a Regulator. (8)

   (ii)Discuss the working principle, characteristics and applications of LED in detail. (8)

Unit II: Transistors

Part A (2 Marks)

1. In a CB connection, the value of I_E is 6.28 mA and the collector current I_C is 6.20 mA. Determine DC current gain.
2. Name the operating modes of a transistor.
3. Which of the BJT configuration is suitable for impedance matching applications? Why?
4. Elucidate thermal run away.
5. State the biasing conditions required for the three regions of operation of a BJT.
6. Give any two differences between E-MOSFET and D-MOSFET.
7. Compare JFET with BJT.
8. What are the special features of FET?
9. Characterize: (a) Pinch off voltage and (b) Amplification factor in JFET.
10. Define R_d, g_m and μ of JFET.

Part-B (16 Marks)

1. (i) Explain the construction and working of UJT and draw the characteristics. (8)
   (ii)With the help of neat diagram explain the operation of BJT. (8)
2. (i) Describe the static input and output characteristics of a CB transistor with neat circuit diagram. (8)
   (ii) Draw and explain the input and Output characteristics of a BJT in CE configuration. (8)
3. (i) Explain the construction and working of enhancement MOSFET. (8)
   (ii) Explain any one method of biasing a single stage BJT amplifier. (8)
4. (i)Explain how the transconductance of a JFET varies with drain current and gate voltage characteristics and transfer characteristics. (8)
   (ii) Explain the construction and working of IGBT. Draw the characteristics. (8)
5. (i) Give the comparison of CE,CB & CC Configurations of transistors. (6)
   (ii) With neat diagram explain the operation of MOSFET in Depletion mode and derive its current equations. (10)

Unit III: Amplifiers

Part A (2 Marks)

1. Draw the h-parameter equivalent circuit of a CE BJT configuration.
2. What are hybrid parameters?
3. Sketch the small signal equivalent circuit of FET.
4. Define Miller's theorem.
5. Describe Bandwidth.
6. What do you mean by amplifier rise time?
7. Define lower & upper cut off frequencies of an amplifier.
8. Characterize small signal equivalent circuit.
9. Give the salient features of hybrid parameters.
10. What is an amplifier & which amplifier is called as voltage follower?

Part- B (16 Marks)

1. (i)Describe about small signal MOSFET amplifiers and obtain the expression for its transconductance. (8)

   (ii) Draw the Hybrid model of BJT-CE amplifier and also derive the expressions for its current and voltage gain. (8)

2. Explain the operation of CE,CC and CB amplifier in BJT with appropriate diagrams. (16)
3. (i)For a common collector circuit draw the h-parameter equivalent circuit and write the expressions for input impedance and output impedance. (8)

   (ii) Draw the h-parameter equivalent circuit of a transistor in CB configuration. (8)

4. (i)The hybrid parameters of a transistor used as an amplifier in the CE configuration are hie= 800Ω, hfe = 46, hoe = 80 x 10^{-6} and hre = 5.4x 10^{-4}. If RL = 5K and Rs=500Ω. Find current gain, voltage gain, input impedance and output impedance. (8)

   (ii) Describe the operation of common drain FET amplifier and derive the equation for voltage gain. (8)

5. (i)With a neat circuit diagram explain the operation of a common source amplifier. (8)

   (ii)From the low frequency model, determine the input and output impedances and the voltage gain of a JFET. (8)

Unit-IV: Multistage Amplifiers and Differential Amplifier

Part A (2 Marks)

1. Why we go for differential amplifier?
2. Define CMRR & State the various methods of improving CMRR.
3. Explain the bootstrapping technique.
4. Illustrate the coupling methods used for coupling in multistage amplifiers?
5. Enumerate tuned amplifiers & its types.
6. Mention the applications of class C tuned amplifier.
7. What is Neutralization? Give its types.
8. Characterize the following modes of operation (a) Class AB (b) Class C.
9. Define cross over distortion & conversion efficiency of a power stage.
10. Write down the values of maximum possible power conversion efficiency for class A direct coupled and transformer coupled.

Part-B (16 Marks)

1. (i) With neat sketch explain two stage cascaded amplifier and derive its overall Av, AI, RI and Ro.(10)
   (ii) Compare CB, CE and CC amplifiers. (6)
2. (i)Draw AC equivalent circuit a differential amplifier and derive its differential mode gain and common mode gain. (8)
   (ii) Develop the equation for differential mode gain and common mode gain of a differential amplifier using FET. Derive the expression for differential mode gain and common mode gain. (8)
3. (i)Illustrate the circuit of emitter coupled BJT differential amplifier, and derive expressions for differential gain, common mode gain and CMRR. (8)
   (ii) What is Neutralization? Explain any one method of Neutralization in brief. (8)
4. (i)Explain the operation of the transformer coupled class A audio power amplifier. (8)
   (ii)Explain the terms conversion efficiency and maximum value of efficiency used in audio power amplifiers. (8)
5. (i)Explain the operation of the class-B power amplifier with neat diagram and list its advantages. (8)
   (ii) Outline the operation of class AB amplifier to avoid cross over distortion. (8)

Unit-V: Feedback Amplifiers and Oscillators

Part A (2 Marks)

1. List the advantages of negative feedback amplifiers.
2. Mention any two high frequency LC oscillators.
3. What is meant by feedback? types
4. Define feedback factor β.
5. Formulate the barkhausen criterion for the feedback oscillators.
6. Give the expression for gain of an amplifier with feedback.
7. Compare LC oscillators and crystals oscillators.
8. Differentiate oscillator and amplifier.
9. Write down the general applications of oscillators.
10. Express the frequency of oscillations for a Wein bridge oscillator.

Part B (16 Marks)

1. With a neat block diagram explain the operation of following feedback amplifiers and derive the equation for input impedance, output impedance and the voltage gain.
   (i) Voltage series feedback amplifier (8)
   (ii) Current shunt feedback amplifier (8)
2. (i)Calculate the voltage gain, input and output resistances of a voltage series feedback amplifier having $A_V = 300$, Ri = 1.5 k, Ro = 50 k and $\beta = 1/15$. (8)
   (ii) Illustrate the operation of Colpitts oscillator with neat circuit diagram. Also derive the expressions for the frequency of oscillation and the condition for maintenance of oscillation. (8)
3. (i)Examine the operation of Hartley oscillator and derive the condition for the frequency of oscillation. (10)
   (ii) What is feedback? Show the difference between positive and negative feedback. Why negative feedback is very commonly used in many control and instrumentation circuits? (6)
4. (i) Sketch the circuit diagram the operation of a Wien bridge oscillator.(8)
   (ii) With a neat diagram explain the construction of RC phase shift oscillator.(8)
5. Demonstrate the following feedback configurations of amplifiers and obtain the feedback factor and closed loop gain.
   (i) Current series feedback (8)
   (ii) Voltage shunt feedback (8)