SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code : Basic Electronic Devices (16EC401) **Course & Branch**: B.Tech - ECE

Year & Sem: II-B.Tech & I-Sem **Regulation:** R16

UNIT –I

PN JUNCTION DIODE

1. a) Discuss the Energy bands in intrinsic and extrinsic silicon. [L2][CO1][5M]
   b) Write notes on carrier transport in semiconductor. [L2][CO1][5M]
2. a) Explain Drift and Diffusion current for a semiconductor. [L2][CO1][5M]
   b) With expressions, explain mobility and conductivity of a semiconductor. [L2][CO1][5M]
3. a) Describe generation and recombination of carriers. [L1][CO1][5M]
   b) Derive the expression for Continuity equation for a semiconductor. [L1][CO1][5M]
4. a) What is a PN Junction? Explain the formation of depletion layer in a PN junction. [L2][CO1][5M]
   b) Discuss current components in a PN junction diode. [L2][CO1][5M]
5. With neat diagrams, explain forward and reverse biasing of a PN Junction diode. Draw its V-I Characteristics. [L2][CO1][10M]
6. a) Derive the Diode Current Equation. [L1][CO1][5M]
   b) Write notes on Diode Resistance. [L2][CO1][5M]
7. a) Describe the Temperature Dependence of PN Junction Diode on VI Characteristics. [L1][CO1][7M]
   b) Determine the value of forward current in the case of a PN junction diode, with I_o = 10μA, V_f = 0.8V at T = 300^0K. Assume Silicon Diode. [L3][CO1][3M]
8. a) How does the reverse saturation current of PN junction diode varies with temperature? Explain. [L2][CO1][5M]
   b) Find the factor by which the reverse saturation current of a silicon diode will get multiplied when the temperature is increased from 27^0C to 82^0C. [L3][CO1][5M]
9. a) What is transition capacitance? Derive the expression for transistion capacitance of a PN Junction Diode. [L1][CO1][5M]
   b) Mention the importance of Diffusion capacitance. Derive the expression for Diffusion capacitance of a PN Junction Diode. [L1][CO1][5M]
10. a) Draw and explain the energy band diagram of PN Junction Diode. [L2][CO1][5M]
    b) Calculate the dynamic forward and reverse resistnace of PN Junction silicon diode when the applied voltage is 0.25V at T = 300^0K with given I_o = 2μA. [L3][CO1][5M]

UNIT –II

SPECIAL SEMICONDUCTOR DEVICES

1. a) Compare Zener Breakdown and Avalanche Breakdown in detail. [L4][CO1][5M]
   b) Discuss the applications of Zener Diode. [L2][CO1][5M]
2. a) Draw and explain the VI characteristics of a Zener Diode. [L2][CO1][6M]
   b) Compare and contrast Zener diode and conventional PN Junction Diode. [L4][CO1][4M]
3. a) Draw and explain the basic structure of LED. Mention the applications of LED. [L2][CO1][5M]
   b) Write notes on Liquid Crystal Display. [L2][CO1][5M]
4. a) Describe the characteristics and applications of a photodiode. [L1][CO1][6M]
   b) What is Varactor Diode? Mention the applications of Varactor Diode. [L1][CO1][4M]
5. a) Draw and explain VI characteristics of Tunnel Diode. [L2][CO1][5M]
   b) Discuss the energy band structure of a Tunnel Diode. [L2][CO1][5M]
6. a) Discuss the basic structure and characteristics of TRIAC. [L2][CO1][5M]
   b) Write notes on DIAC. Mention the applications of DIAC. [L2][CO1][5M]
7. a) Draw the basic structure of an SCR. Explain its characteristics and list the applications. [L2][CO1][8M]
   b) Define Holding Current and Latching Current of SCR. [L1][CO1][2M]
8. a) With neat diagram, describe the working principle and characteristics of UJT. [L1][CO1][6M]
   b) Write notes on Photo Transistor. [L2][CO1][4M]
9. a) Discuss about IR Emitters and mention the applications of IR Emitters. [L2][CO1][5M]
   b) Explain the construction and applications of Solar Cell. [L2][CO1][5M]
10. a) Explain the construction and working principle of Schottky Barrier Diode. [L2][CO1][6M]
    b) Compare the V – I characteristics of Schottky Barrier Diode with PN Junction Diode. [L4][CO1][4M]

UNIT –III

RECTIFIERS AND FILTERS

1. a) Draw the circuit diagram of half wave rectifier and explain its operation with the help Of waveforms. [L2][CO1][5M]
   b) Derive the expressions for Ripple Factor and Efficiency of Half Wave Rectifier. [L1][CO1][5M]
2. Derive the expressions for Average DC current, Average DC Voltage, RMS Value of Current, DC Power Output and AC Power Input of a Half Wave Rectifier. [L1][CO1][10M]
3. a) Draw the circuit diagram of Full wave rectifier and explain its operation with the help Of waveforms. [L2][CO1][5M]
   b) Derive the expressions for Ripple Factor and Efficiency of Full Wave Rectifier. [L1][CO1][5M]
4. Derive the expressions for Average DC current, Average DC Voltage, RMS Value of Current, DC Power Output and AC Power Input of a Half Wave Rectifier. [L1][CO1][10M]
5. A Half wave rectifier has a load of 3.5kΩ. If the diode resistance and the secondary coil Resistance together have resistance of 800Ω and the input voltage of 240V, Calculate (i) Peak, Average and RMS value of the current flowing, (ii) DC power output, (iii) AC Power input and (iv) efficiency of the rectifier. [L1][CO1][10M]
6. a) With neat diagram, explain Bridge Rectifier. [L2][CO1][5M]
   b) A bridge rectifier uses four identical diodes having forward resistance of 5Ω each. Transformer secondary resistance is 5Ω and the secondary voltage of 30V (rms). Determine the DC output voltage for I_{DC} = 200mA and the value of the ripple voltage. [L1][CO1][5M]
7. a) Draw the circuit of capacitor filter and explain its operation. [L2][CO1][5M]
   b) Derive the expression for ripple factor of HWR and FWR with capacitor filter. [L1][CO1][5M]
8. a) Draw the circuit of inductor filter and explain its operation. [L2][CO1][5M]
   b) Derive the expression for ripple factor of inductor filter. Mention the need of Bleeder resistor. [L1][CO1][5M]
9. a) Discuss the L Section Filter with neat diagram. [L2][CO1][4M]
   b) Derive the Ripple Factor For L Section Filter. [L1][CO1][6M]
10. a) Derive the expression for Ripple Factor of CLC Filter. [L1][CO1][6M]
    b) Compare the different types of filter circuits in terms of ripple factors. [L4][CO1][4M]

UNIT IV

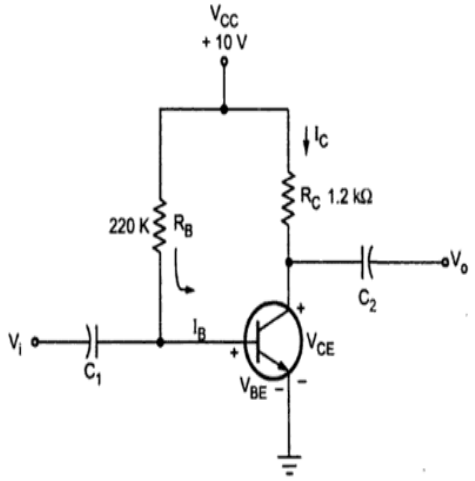
TRANSISTOR CHARACTERISTICS

1. a) Discuss the operation of NPN transistor with diagram. [L2][CO2][5M]
   b) With reference to BJT, explain the following terms Emitter Efficiency, Base Transportation Factor and Large signal current gain. [L2][CO2][5M]
2. a) Give the current components of PNP transistor and explain. [L1&L2][CO2][5M]
   b) If the base current in a transistor is 20μA when the emitter current is 6.4mA, what are the values of α and β? Also calculate the collector current. [L3][CO2][5M]
3. a) A transistor operating in CB configuration has I_C = 2.98mA, I_E = 3.00 mA and I_{CO} =0.01 mA. What current will flow in the collector circuit for this transistor when connected in CE configuration with a base current of 30μA? [L3][CO2][5M]
   b) Write notes on early effect of a BJT? [L1][CO2][5M]
4. a) Describe the phenomena of punch through or reach through in a transistor. [L1][CO2][5M]
   b) Derive the relation between α, β and ϒ of a Transistor. [L1][CO2][5M]
5. a) With a neat diagram, explain how a transistor acts as an amplifier? [L2][CO2][5M]
   b) Discuss Ebers-Moll Model of BJT. [L2][CO2][5M]
6. With neat diagram, explain the Input and Output characteristics of a BJT in CE Configuration. [L2][CO2][10M]
7. a) With neat sketches explain the cut off region, active region and saturation region Of a common base transistor output characteristics. [L2][CO2][5M]
   b) Discuss the Input and Output characteristics of BJT in CC Configuration. [L2][CO2][5M]
8. a) Explain the construction and principle of operation of N-channel JFET. [L2][CO2][5M]
   b) Define the JFET Volt-Ampere Characteristics and determine FET parameters. [L1][CO2][5M]
9. With the help of neat diagram, explain the operation and characteristics of n-channel enhancement type MOSFET. [L2][CO2][10M]
10. a) Discuss the operation and drain characteristics of n-channel depletion type MOSFET. [L2][CO2][5M]
    b) Give the comparison between JFET and MOSFET. [L4][CO2][5M]

UNIT- V

TRANSISTOR BIASING AND THERMAL STABILIZATION

1. a) Define Transistor Biasing and explain the need for Biasing? [L1][CO3][5M]
   b) Explain the concept of DC and AC Load lines and discuss the criteria for fixing the Q-point. [L2][CO3][5M]
2. a) Mention different types of Biasing a Transistor. And explain the Fixed Bias of a Transistor in detail. [L2][CO3][5M]
   b) Define stability Factor of a Transistor and derive the expression for it. [L1& L3][CO3][5M]
3. a) Explain Collector to Base bias of a Transistor with neat circuit diagram [L2][CO3][5M]
   b) Describe the factors to be considered while designing the biasing circuit which are responsible for shifting the operating point. [L1][CO3][5M]
4. Derive the stability factors S, S' and S'' of a Transistor Voltage Divider bias . [L3][CO3][10M]
5. a) For the circuit shown in the Figure, calculate I_B, I_C, V_{CE}, V_B , V_C and V_{BC}. Assume that $V_{BE} = 0$ and $\beta = 50$. [L3][CO3][5M]



   b) Mention the advantages and disadvantages of various biasing techniques of BJT. [L2][CO3][5M]
6. a) Design a collector to base bias circuit for the specified conditions: $V_{cc} = 15V$, $V_{CE} = 5V$, $I_C = 5mA$ and $\beta = 100$. [L6][CO3][5M]
   b) Discuss Diode Compensation Technique for the parameters V_{BE} and I_{CO}. [L2][CO3][5M]
7. a) Describe Thermistor and Sensistor Compensation Techniques. [L1][CO3][5M]
   b) Discuss about Thermal Runaway and Thermal Resistance. [L2][CO3][5M]
8. Derive the condition for Thermal Stability to avoid thermal runaway. [L3][CO3][10M]
9. a) Derive the expression for Stability Factor S of a Fixed Bias Circuit. [L3][CO3][5M]
   b) Derive the expression for Stability Factor S of a Collector to Base Bias Circuit. [L3][CO3][5M]
10. a) Define the three stability factors of BJT and explain the need of these stability factors In BJT. [L2][CO3][5M]
    b) With neat diagram, explain Voltage Divider Bias Circuit for JFET. [L2][CO3][5M]

Prepared by:
1. Mr M. Afsar Ali
Professor/ECE
2. Ms P.Ratna Kamala
Professor/ECE