



**SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
(AUTONOMOUS)**

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QUESTION BANK (DESCRIPTIVE)

Subject with Code : Basic Electronic Devices (16EC401)

Course & Branch: B.Tech - EEE

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 $I_o = 10\mu\text{A}$, $V_f = 0.8\text{V}$ at $T = 300^{\circ}\text{K}$. 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°C to 82°C . [L3][CO1][5M]
9. a) What is transition capacitance? Derive the expression for transition 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 resistance of PN Junction silicon diode when the applied voltage is 0.25V at $T = 300^{\circ}\text{K}$ with given $I_o = 2\mu\text{A}$. [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 $3.5k\Omega$. 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

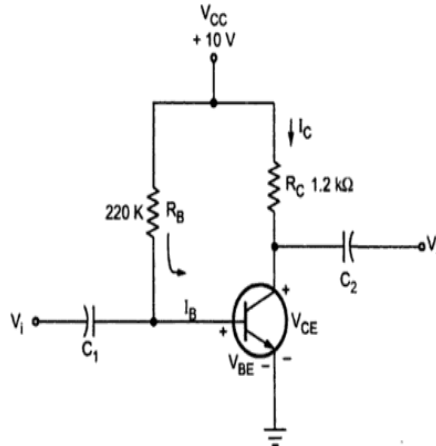
1. a) Discuss the operation of NPN transistor with diagram. [L2][CO2][5M]
 b) With reference to BJT, explain the following terms Emitter Efficiency, Base Transportation Factor and Large signal current gain. [L2][CO2][5M]
2. a) Give the current components of PNP transistor and explain. [L1&L2][CO2][5M]
 b) If the base current in a transistor is $20\mu\text{A}$ 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 $I_C = 2.98\text{mA}$, $I_E = 3.00\text{mA}$ and $I_{CO} = 0.01\text{mA}$. What current will flow in the collector circuit for this transistor when connected in CE configuration with a base current of $30\mu\text{A}$? [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 γ 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]

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