SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR-517583
(AUTONOMOUS)

QUESTION BANK (DESCRIPTIVE)

Subject with Code: Electronic Devices and Circuits (19EC0402) **Course & Branch**: B.Tech - EEE

Year & Sem: II-B.Tech & I-Sem **Regulation:** R19

UNIT –I
PN JUNCTION DIODE

1. a) Define cut in voltage of a PN Junction diode and give its values for Si and Ge diodes. [L1][CO1][4M]
   b) Illustrate the action of PN junction diode under forward bias and reverse bias and sketch its V-I Characteristics. [L2][CO1][6M]
2. a) Analyze the current components in a PN diode and determine the expression for diode current equation. [L4][CO1][6M]
   b) When a reverse bias is applied to a germanium PN junction diode, the reverse saturation current at room temperature is 0.3μA. Determine the current flowing in the diode when 0.15V forward bias is applied at room temperature. [L1][CO4][4M]
3. a) Solve the diode current for the forward bias voltage of 0.6V at 25^0C, When the reverse saturation current of a silicon PN junction diode is 10μA. [L3][CO4][4M]
   b) Demonstrate the effect of temperature on V-I characteristics of PN junction diode. [L2][CO1][6M]
4. a) Construct the circuit symbol for the ideal diode characteristics. [L4][CO1][4M]
   b) A p-n junction germanium diode has a reverse saturation current of 0.10 μA at the room temperature of 27^0C. It is observed to be 30μA, when the room temperature is increased. Calculate the new room temperature. Also determine the current passing through the diode at this new temperature. [L3][CO4][6M]
5. a) Explain about Diode resistances and determine the expression for forward dynamic resistance. [L2][CO1][6M]
   b) Determine the forward resistance of a PN junction diode when the forward current is 5mA at T = 300 K. Assume Silicon diode. [L4][CO4][4M]
6. a) Define Transition and Diffusion capacitances of a PN Junction Diode. [L1][CO1][4M]
   b) Determine the expression for transition capacitance of a PN Junction Diode. [L5][CO1][6M]
7. a) List the application of PN junction and Zener diodes. [L1][CO1][4M]
   b) Determine the expression for Diffusion capacitance of a PN Junction Diode. [L5][CO1][6M]
8. a) Define Breakdown voltage and give the circuit symbol for Zener Diode. [L1][CO1][4M]
   b) Discuss Breakdown mechanisms in PN Junction Diode. [L1][CO1][6M]
9. a) Define the importance of Diode Clipper and list its applications. [L1][CO1][4M]
   b) Draw and explain the V-I characteristics of Zener diode. Show that the Zener diode can act as a voltage regulator with a neat diagram. [L1][CO5][6M]
10. a) Discuss the Positive and Negative Diode Clippers with neat waveforms. [L1][CO5][5M]
    b) What is a Clamper circuit? Describe about positive and negative clampers with neat circuit diagrams. [L1][CO5][5M]

UNIT –II
RECTIFIERS, FILTERS AND SPECIAL PURPOSE DEVICES

1. a) Construct the circuit diagram of a Half wave rectifier and explain its operation with the help of i/p-o/p waveforms. [L2][CO1][5M]
   b) Determine 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][5M]
2. a) Construct the circuit diagram of a Full wave rectifier and explain its operation with the help of i/p- o/p waveforms. [L2][CO1][5M]
   b) Determine the expressions for Average DC current, Average DC Voltage, RMS Value of Current, DC Power Output and AC Power input of a Full Wave Rectifier. [L1][CO1][5M]
3. a) A half wave rectifier is supplied from a 230V, 50 Hz supply with a step-down ratio of 3:1 to a resistive load of 10kΩ. The diode forward resistance is 75Ω while transformer secondary is 10Ω. Calculate maximum, average, RMS values of current, DC output voltage, efficiency of rectification and ripple factor. [L5][CO1][5M]
   b) A full wave rectifier circuit is fed from a transformer having a center-tapped secondary winding. The rms voltage from either end of secondary to center tap is 30V. If the diode forward resistance is 2Ω and that of the half secondary is 8Ω, for a load of 1 KΩ, calculate DC power delivered to the load, efficiency of rectification and TUF of secondary. [L3][CO2][5M]
4. a) Construct a neat circuit diagram and waveforms, illustrate the construction and working of Bridge rectifier. [L2][CO1][5M]
   b) A 5KΩ load is fed from a bridge rectifier connected across a transformer secondary whose primary is connected to 460V, 50 Hz supply. The ratio of number of primary turns to secondary turns is 2:1. Calculate dc load current, ripple voltage and PIV rating of diode. [L3][CO4][5M]
5. a) Construct the circuit diagram of Full wave rectifier with inductor filter and illustrate its operation. Also derive the expression for ripple factor. [L2][CO3][5M]
   b) Calculate the value of inductance to be used in the inductor filter connected to a full wave rectifier operating at 60 Hz to provide a dc output with 4% ripple for a 100Ω load. [L3][CO2][5M]
6. a) Construct neat circuit diagram and waveforms, discuss the operation of Full wave rectifier with capacitor Filter and determine the expression for its ripple factor. [L5][CO3][[5M]
   b) Calculate the value of capacitance to be used in a capacitor filter connected to a full wave rectifier operating at a standard aircraft power frequency of 400 Hz, if the ripple factor is 10% for a load of 500Ω. [L3][CO2][5M]
7. a) Demonstrate the working principle of LC filter with neat diagram and derive the expression for its ripple factor. [L2][CO3][5M]
   b) Discuss the construction and working principle of CLC or π section filter along with derivation for its ripple factor. [L3][CO2][5M]
8. a) Explain Liquid Crystal Display. Illustrate dynamic scattering LCD and field effect LCD with neat diagram. [L2][CO3][5M]
   b) Discuss the construction, working principle and characteristics of LED with neat diagram. Also list the and applications of LED. [L3][CO2][5M]

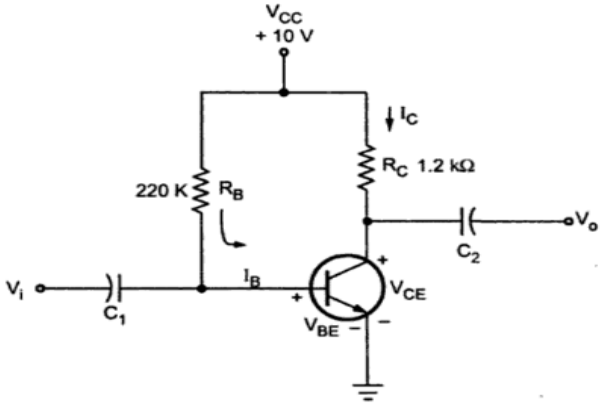
9. a) Explain the principle involved in working of Varactor diode and give its characteristics. [L1][CO5][5M]
   b) Sketch and explain the volt ampere characteristics of a Tunnel diode with the help of energy band diagrams. List the applications of tunnel diode. [L2][CO5][5M]
10. a) Demonstrate the construction, working and characteristics of UJT with neat diagram. [L2][CO5][5M]
    b) Explain with diagram the construction, working and applications of Solar Cell. [L1][CO5][5M]

UNIT –III
TRANSISTOR CHARACTERISTICS: BJT & FET

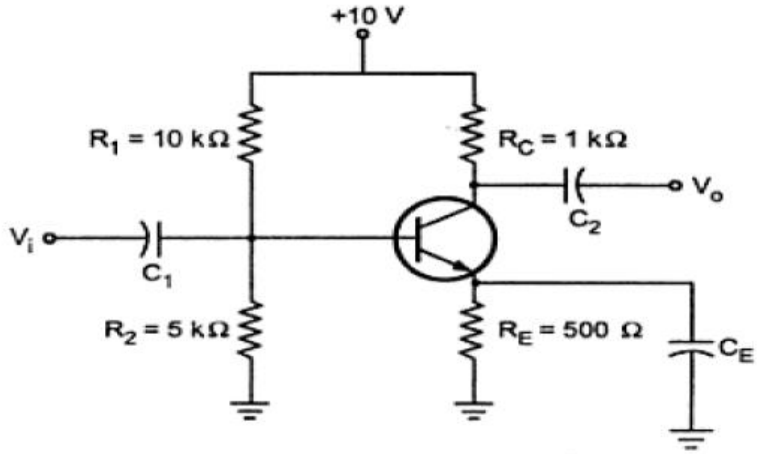
1. a) Discuss the operation of NPN transistor with diagram. [L2][CO1][5M]
   b) If the base current in a transistor is 20μA when the emitter current is 6.4mA, what are the values of α and β? Also calculate the collector current. [L3][CO4][5M]
2. a) Give the current components of PNP transistor and explain the terms Emitter Efficiency, Base Transportation Factor and Large signal current gain. [L1][CO1][5M]
   b) With neat diagram, explain the Input and Output characteristics of a BJT in CB Configuration. [L2][CO5][5M]
3. Discuss the Input and Output characteristics of a BJT in CE Configuration. Indicate the regions of operations in the output characteristics and list the applications in those regions. [L2][CO5][10M]
4. a) Describe the Input and Output characteristics of BJT in CC Configuration. [L2][CO5][6M]
   b) Explain how a transistor acts as an amplifier with neat diagram? [L2][CO1][4M]
5. a) Derive the relation between α, β and ϒ of a Transistor. [L1][CO1][5M]
   b) For a transistor, the leakage current is 0.1μA in CB configuration, while it is 19μA in CE configuration. Calculate α & β of the same transistor? [L3][CO4][5M]
6. Describe the construction and working principle of N-channel JFET. [L2][CO1][10M]
7. a) Define the JFET Volt-Ampere Characteristics and determine FET parameters. [L1][CO1][5M]
   b) Compare the performance of BJT with FET. [L3][CO1][5M]
8. a) Explain the operation and characteristics of n-channel enhancement type MOSFET with the help of a neat diagram . [L2][CO5][8M]
   b) List the differences between depletion and enhancement MOSFET. [L3][CO1][2M]
9. Discuss the operation and characteristics of n-channel depletion type MOSFET with diagram. [L2][CO5][10M]
10. a) Compare the performance of JFET with MOSFET. [L3][CO1][6M]
    b) Mention the applications of JFET and MOSFET. [L1][CO1][4M]

UNIT- IV
TRANSISTOR BIASING AND THERMAL STABILIZATION

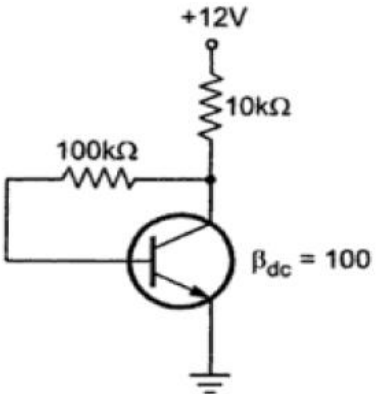
1. a) Define Transistor Biasing and explain the need for Biasing. [L1][CO3][5M]
   b) Explain the concept of DC and AC Load lines and discuss the criteria for fixing the Q-point. [L2][CO3][5M]
2. a) Mention different types of Biasing a Transistor and explain the Fixed Bias of a Transistor [L2][CO6][5M]
   b) Explain Collector to Base bias of a Transistor with neat circuit diagram. [L2][CO6][5M]
3. a) Determine the expressions for the stability factors S, S' and S'' of a BJT Fixed bias. [L3][CO3][8M]
   b) What are the disadvantages of fixed bias circuit of BJT? [L1][CO1][2M]
4. a) Define Stability Factor S. Derive the stability factor S for collector to base bias of BJT. [L3][CO6][5M]
   b) Design a collector to base bias circuit for the specified conditions: V_{cc} = 15V, V_{CE} = 5V, I_C = 5mA and β = 100. [L6][CO2][5M]
5. Derive the stability factors S, S' and S'' of a BJT Voltage Divider bias. [L3][CO6][10M]
6. 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 β = 50. [L3][CO2][5M]



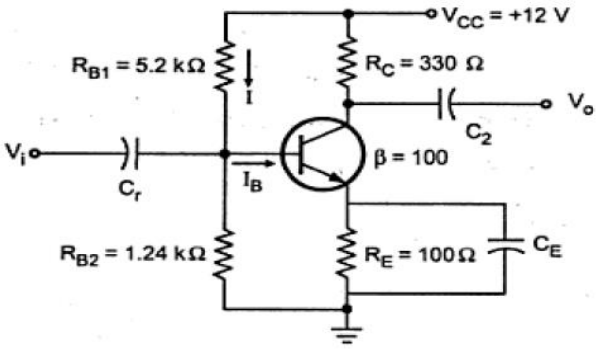
   b) Discuss Diode Compensation Technique for the parameters V_{BE} and I_{CO}. [L2][CO3][5M]
7. a) Describe Thermistor Compensation Technique. [L1][CO3][4M]
   b) For the circuit shown in Fig. β = 100 for the silicon transistor. Calculate V_{CE} and I_C. [L3][CO2][5M]



8. a) Discuss about Thermal Runaway and Thermal Resistance. [L2][CO3][5M]
   b) Calculate the Q-point values for the circuit shown in the Fig. [L3][CO2][5M]



9. Draw the dc load line for the following transistor configuration. Obtain the quiescent Point. [L3][CO2][10M]



10. a) Describe Sensistor Compensation Technique. [L1][CO3][4M]

b) Derive the condition for achieving Thermal Stability. [L3][CO3][6M]

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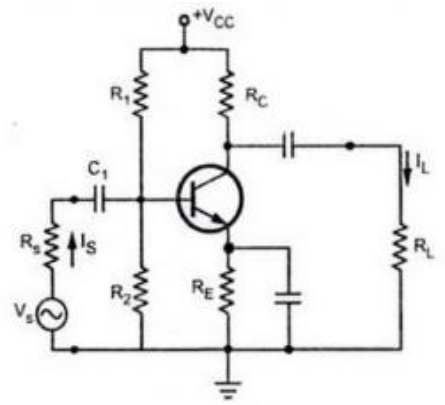
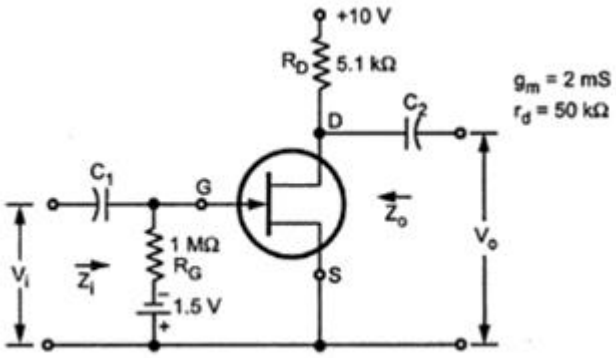
UNIT- V
SMALL SIGNAL LOW FREQUENCY TRANSISTOR AMPLIFIER

1. a) Discuss the frequency response of an amplifier. [L2][CO1][4M]
   b) Why hybrid model is used for the analysis of BJT amplifier at low frequencies? Draw the hybrid model for CE transistor and derive the hybrid parameters. [L2][CO1][6M]
2. Applying low frequency h-parameter model, derive the expressions for voltage gain, current gain, input impedance and output admittance for a BJT Amplifier in CE configuration. [L3][CO3][10M]
3. a) Derive the parameters of CE amplifier using approximate analysis with a neat diagram. [L2][CO3][5M]
   b) Obtain the expressions for current gain, voltage gain, input impedance and output impedance of CB amplifier using simplified hybrid model. [L2][CO3][5M]
4. a) Determine the parameters Ai, R_i, A_v and R_0 of Common Collector Amplifier using simplified hybrid model analysis. [L3][CO3][5M]
   b) A voltage source of internal resistance, $R_s = 900\Omega$ drives a CC amplifier using load resistance $R_L=2000\Omega$. The CE h parameters are $h_{fe}=60$, $h_{ie}=1200\Omega$, $h_{oe} = 25\mu A/V$ and $h_{re} = 2 \times 10^{-4}$. Compute A_I, R_i, A_v and R_0 using approximate analysis. [L3][CO2][5M]
5. A CE amplifier is driven by a voltage source of internal resistance $R_s = 800\Omega$ and the load impedance of $R_L=1000\Omega$. The h-parameters are $h_{ie}=1k$, $h_{fe}=50$, $h_{oe} = 25\mu A/V$ and $h_{re} = 2 \times 10^{-4}$. Calculate current gain, voltage gain, input impedance and output impedance using exact analysis and approximate analysis. [L3][CO2][10M]
6. For a CB transistor amplifier driven by a voltage source of internal resistance $R_s = 1200\Omega$, the load Impedance of $R_L = 1000\Omega$. The h parameters are $h_{ib} = 22\Omega$, $h_{rb} = 3 \times 10^{-4}$, $h_{fb} = -0.98$, $h_{ob} = 0.5\mu A/V$. Calculate current gain, voltage gain, input impedance and output impedance using exact analysis and approximate analysis. [L3][CO2][10M]
7. Consider a single stage CE amplifier with $R_s = 1k\Omega$, $R_1 = 50k\Omega$, $R_2 = 2k\Omega$, $R_c = 1k\Omega$, $R_L = 1.2k\Omega$, $h_{fe}=50$, $h_{ie}=1.1k$, $h_{oe} = 25\mu A/V$ and $h_{re} = 2.5 \times 10^{-4}$, as shown in Fig. Find A_I, R_i, A_v, A_{vs}, A_{IS} and R_0. [L3][CO2][10M]



8. a) Obtain the expression for current gain, voltage gain, input impedance and output impedance for Common Emitter Amplifier with Emitter Resistor using simplified hybrid model. [L2][CO3][5M]
   b) A CE amplifier is driven by a voltage source of internal resistance $R_s = 1000\Omega$ and the load impedance of $R_C=2k\Omega$. The h-parameters are $h_{ie}=1.3k$, $h_{fe}=55$, $h_{oe} = 22\mu A/V$ and $h_{re} = 2 \times 10^{-4}$. Neglecting biasing resistors, compute current gain, voltage gain, input impedance, output impedance for the value of Emitter Resistor $R_E = 200\Omega$ inserted in the emitter circuit. [L3][CO2][5M]
9. a) For the circuit shown in Figure below, determine input impedance, output impedance and voltage gain. [L4][CO5][5M]



b) Sketch the circuit diagram of JFET Common Source amplifier with voltage divider bias for by passed R_s and determine the expression for input impedance, output impedance and voltage gain. [L2][CO6][5M]

10. Derive the expressions for input impedance, output impedance and voltage gain of JFET Common Drain amplifier with neat diagram. [L2][CO5][10M]