SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code : Electronic Devices (18EC0401) **Course & Branch**: B.Tech - ECE

Year & Sem: II-B.Tech & I-Sem **Regulation:** R18

UNIT –I

PN JUNCTION DIODE

I. Two Mark Questions:

1. What is depletion region? [L1][CO1][2M]
2. Define barrier potential. [L1][CO1][2M]
3. Why the resistance is decreased during forward bias? [L2][CO1][2M]
4. Define Breakdown Voltage of a PN junction diode. [L1][CO1][2M]
5. What do you understand by reverse saturation current? [L2][CO1][2M]
6. Write down the diode current equation. [L2][CO1][2M]
7. 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. [L3][CO1][2M]
8. Mention the types of Diode Capacitances. [L1][CO1][2M]
9. Define storage time and transition time of a PN junction diode. [L1][CO1][2M]
10. Mention the applications of PN Junction diode. [L1][CO1][2M]

II. Part – B Questions:

1. a) What is a PN Junction? Explain the formation of depletion layer in a PN junction. [L2][CO1][5M]
   b) Discuss the differences between Ideal Diode and Practical Diode. [L2][CO1][5M]
2. With neat diagrams, explain forward and reverse biasing of a PN Junction diode. Draw its V-I Characteristics. [L2][CO1][10M]
3. Derive the expression for depletion width of a PN Junction. [L2][CO1][10M]
4. Describe the energy band structure of open circuited PN Junction and derive the expression for Contact difference of potential. [L2][CO1][10M]
5. a) Derive the Diode Current Equation. [L1][CO1][5M]
   b) Write notes on Diode Resistance. [L2][CO1][5M]
6. a) What is transition capacitance? [L1][CO1][2M]
   b) Derive the expression for transition capacitance of a PN Junction Diode. [L3][CO1][8M]
7. a) Mention the importance of Diffusion capacitance. [L1][CO1][2M]
   b) Derive the expression for Diffusion capacitance of a PN Junction Diode. [L3][CO1][8M]
8. 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]
9. a) Write notes on Breakdown in PN Junction diodes. [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]
10. Discuss about the switching characteristics of PN junction diode with suitable diagrams. [L2][C01][10M]
11. a) Mention the importance of Diode Clipper. Discuss the Positive and Negative Diode Clippers. [L1][CO1][5M]
    b) What is Clamper circuit? Describe about positive and negative clampers with neat circuit diagrams. [L1][CO1][5M]

UNIT –II

RECTIFIERS, FILTERS AND SPECIAL PURPOSE DEVICES

I. Two Mark Questions:

1. What is rectifier? [L1][CO2][2M]
2. Compare half wave rectifier and Full wave rectifier. [L2][CO2][2M]
3. Define Peak Inverse Voltage of Half Wave Rectifier. [L1][CO2][2M]
4. What are the disadvantages of half wave rectifier? [L2][CO2][2M]
5. Mention the advantages of Full Wave Rectifier. [L1][CO2][2M]
6. Write down the need for filters in power supplies. [L2][CO2][2M]
7. Calculate the ripple factor of a LC filter with FWR for a inductance of 10H and Capacitance of 8μ for 50Hz AC input supply. [L3][CO2][2M]
8. What are the applications of Zener Diode? [L1][CO2][2M]
9. Mention the applications of Varactor Diode. [L1][CO2][2M]
10. Define Tunneling. [L1][CO2][2M]

II. Part – B Questions:

1. a) Draw the circuit diagram of half wave rectifier and explain its operation with the help Of waveforms. [L2][CO2][5M]
   b) Derive the expressions for Ripple Factor and Efficiency of Half Wave Rectifier. [L1][CO2][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][CO2][10M]
3. a) Draw the circuit diagram of Full wave rectifier and explain its operation with the help Of waveforms. [L2][CO2][5M]
   b) Derive the expressions for Ripple Factor and Efficiency of Full Wave Rectifier. [L1][CO2][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 Full Wave Rectifier. [L1][CO2][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][CO2][10M]
6. a) With neat diagram, explain Bridge Rectifier. [L2][CO2][5M]
   b) Compare the different types of filter circuits in terms of ripple factors. [L4][CO2][5M]
7. a) Explain the working of capacitor filter and derive the expression for ripple factor of capacitor filter. [L3][CO2][5M]
   b) Derive the expression for ripple factor of inductor filter. [L3][CO2][5M]
8. a) Derive the Ripple Factor For L Section Filter. [L1][CO2][5M]
   b) Derive the expression for Ripple Factor of CLC Filter. [L1][CO2][5M]
9. a) Draw and discuss the VI characteristics of a Zener Diode. [L2][CO2][5M]
   b) Discuss about Varactor diode. [L1][CO2][5M]
10. a) Draw and describe VI characteristics of Tunnel Diode. [L2][CO2][5M]
    b) Describe the characteristics and applications of a photodiode. [L1][CO2][5M]
11. a) Explain the construction and applications of Solar Cell. [L2][CO2][5M]
    b) Draw and explain the basic structure of LED. Mention the applications of LED. [L2][CO2][5M]

UNIT –III

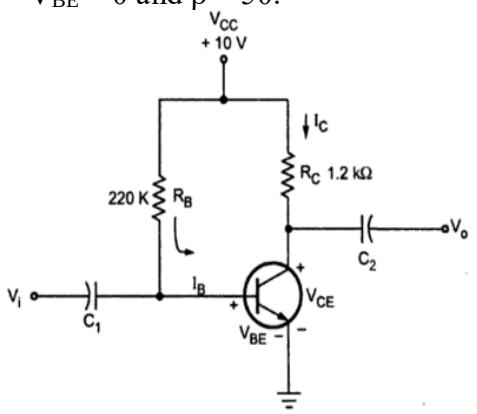
BIPOLAR JUNCTION TRANSISTOR

I. Two Mark Questions:

1. What are the different configurations of BJT? [L1][CO3][2M]
2. Mention the applications of Transistor. [L2][CO3][2M]
3. What do you mean by Punch through Effect? [L1][CO3][2M]
4. Mention the three regions of operation of BJT. [L1][CO3][2M]
5. In Common Base connection, the emitter current is 6.28mA and the collector Current is 6.20mA. Determine common base current gain. [L3][CO3][2M]
6. If a transistor has $\alpha = 0.97$, find the value of β. [L3][CO3][2M]
7. Define Q Point of BJT. [L1][CO3][2M]
8. What is stability factor? [L1][CO3][2M]
9. Mention the disadvantages of fixed bias circuit of BJT. [L1][CO3][2M]
10. What is thermal runaway? How can it be avoided? [L2][CO3][2M]

II. Part – B Questions:

1. a) Discuss the operation of NPN transistor with diagram. [L2][CO3][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][CO3][5M]
2. a) What is early effect of a BJT? [L1][CO3][2M]
   b) With neat diagram, explain the Input and Output characteristics of a BJT in CB Configuration. [L2][CO3][8M]
3. Discuss the Input and Output characteristics of a BJT in CE Configuration. Indicate the regions of operations in the output characteristics. [L2][CO3][10M]
4. a) Describe the Input and Output characteristics of BJT in CC Configuration. [L2][CO3][5M]
   b) Write notes on Breakdown in transistors. [L1][CO3][5M]
5. 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]
6. a) Mention different types of Biasing a Transistor and explain the Fixed Bias of a Transistor [L2][CO3][5M]
   b) Explain Collector to Base bias of a Transistor with neat circuit diagram [L2][CO3][5M]
7. Derive the stability factors S, S' and S'' of a Transistor Voltage Divider bias. [L3][CO3][10M]
8. 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) Discuss Diode Compensation Technique for the parameters V_{BE} and I_{CO}. [L2][CO3][5M]
9. a) Describe Thermistor and Sensistor Compensation Techniques. [L1][CO3][5M]
   b) Discuss about Thermal Runaway and Thermal Resistance. [L2][CO3][5M]
10. Derive the condition for Thermal Stability to avoid thermal runaway. [L3][CO3][10M]
11. 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]

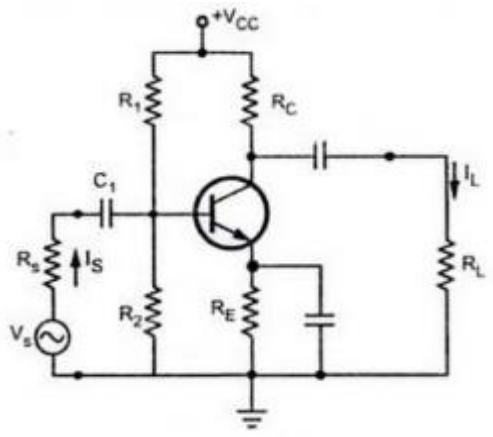
UNIT- IV
SMALL SIGNAL LOW FREQUENCY TRANSISTOR AMPLIFIER ANALYSIS

I. Two Mark Questions:

1. What are the salient features of hybrid parameters? [L1][CO4][2M]
2. Write the hybrid parameters conversion formulae for CC configuration in terms of CE configuration. [L2][CO4][2M]
3. Mention the hybrid parameters conversion formulae for CB configuration in terms of CE configuration.
4. Draw the generalized hybrid model for BJT amplifier. [L2][CO4][2M]
5. Write the expression for current gain A_I for common emitter transistor. [L2][CO4][2M]
6. Write the expression for output admittance Y_o for common emitter transistor. [L2][CO4][2M]
7. For a CE amplifier, if $h_{fe} = 50$, $h_{oe} = 25 \times 10^{-6}$ with load resistance of $R_L = 1k\Omega$, Calculate current gain A_I. [L3][CO4][2M]
8. Draw the approximate CE hybrid model of BJT. [L2][CO4][2M]
9. Draw the simplified hybrid model for CC amplifier. [L2][CO4][2M]
10. Draw the circuit diagram for single stage RC coupled amplifier using BJT. [L2][CO4][2M]

II. Part – B Questions:

1. a) Why hybrid model is used for the analysis of BJT amplifier at low frequencies? Draw the hybrid model for CE transistor and derive the parameters. [L2][CO4][5M]
   b) Compare the CE, CB and CC transistor amplifier parameters. [L2][CO4][5M]
2. Using 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][CO4][10M]
3. a) With neat diagram, derive the CE amplifier parameters using approximate analysis. [L2][CO4][5M]
   b) Obtain the expressions for current gain, voltage gain, input impedance and output impedance of CB amplifier using simplified hybrid model. [L2][CO4][5M]
4. a) Determine the parameters A_I, R_i, A_v and R_0 of Emitter Follower using simplified hybrid model analysis. [L3][CO4][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][CO4][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][CO4][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][CO4][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][CO4][10M]



8. a) Obtain the expression for current gain, voltage gain, input impedance and output impedance For Common Emitter Amplifier with Emitter Resistor. [L2][CO4][5M]

b) A CE amplifier is driven by a voltage source of internal resistance R_s = 1000Ω and the load impedance of R_C=2kΩ. The h-parameters are h_{ie}=1.3k, h_{fe}=55, h_{oe} = 22μA/V and h_{re} = 2 x10^{-4}. Neglecting biasing resistors, compute current gain, voltage gain, input impedance, output impedance for the value of Emitter Resistor R_E = 200Ω inserted in the emitter circuit. [L3][CO4][5M]

9. a) Draw the circuit diagram of a single stage RC coupled Amplifier and discuss the steps used for designing it. [L2][CO4][5M]

b) Determine Voltage Gain, Current Gain, Input resistance and Output resistance for a CE amplifier using NPN transistor with h_{ie} = 1200Ω, h_{re} = 0, h_{fe} = 36 and h_{oe} = 2 x 10^{-6} mhos, R_L = 2.5kΩ and R_S = 500Ω (neglect the effect of biasing circuit). [L3][CO4][5M]

10. Design a single stage RC coupled BJT amplifier for the following values. Assume that for Silicon transistor, V_{cc} = 10V, I_c = 4mA, h_{fe} = 100, h_{ie} = 1kΩ, R_{L-} = 100kΩ and f_L = 100Hz. [L3][CO4][10M]

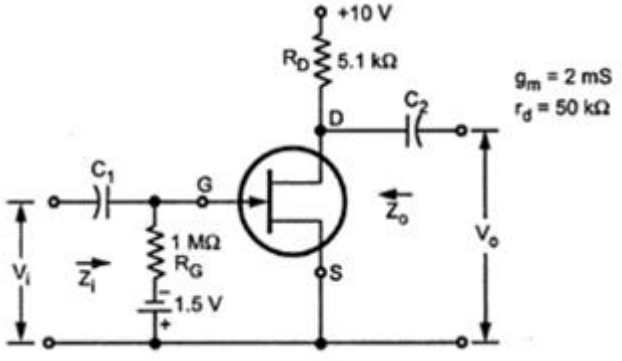
UNIT- V
FIELD EFFECT TRANSISTOR

I. Two Mark Questions:

1. Why a Field Effect Transistor is called so? [L1][CO5][2M]
2. Mention the advantages of FET? [L2][CO5][2M]
3. Define Pinch off Voltage. [L1][CO5][2M]
4. Define drain resistance of JFET. [L1][CO5][2M]
5. What is transconductance of JFET? [L1][CO5][2M]
6. What is MOSFET? Classify the types of MOSFET. [L1][CO5][2M]
7. Draw the symbol for depletion and enhancement n channel MOSFET. [L2][CO5][2M]
8. Draw the drain characteristics of n-channel enhancement MOSFET. [L2][CO5][2M]
9. What is the need for oxidation process in IC fabrication? [L2][CO5][2M]
10. What do you mean by photolithography in IC fabrication process? [L1][CO5][2M]

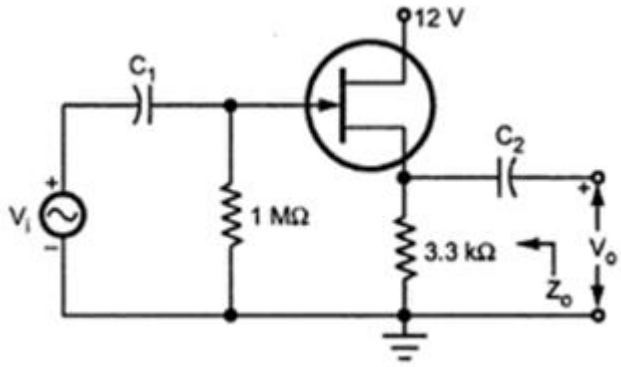
II. Part – B Questions:

1. a) Describe the construction and working principle of N-channel JFET. [L2][CO5][8M]
   b) Mention the applications of JFET. [L1][CO5][2M]
2. a) Define the JFET Volt-Ampere Characteristics and determine FET parameters. [L1][CO5][5M]
   b) Compare the performance of BJT with FET. [L3][CO5][5M]
3. a) With the help of neat diagram, explain the operation and characteristics of n-channel enhancement type MOSFET. [L2][CO5][8M]
   b) Mention the differences between depletion and enhancement MOSFET. [L3][CO5][2M]
4. Discuss the operation and characteristics of n-channel depletion type MOSFET with diagram. [L2][CO5][10M]
5. a) Draw and explain the small signal model of FET at low frequency. [L1][CO5][4M]
   b) For the circuit shown in Fig. determine input impedance, output impedance and voltage gain. [L4][CO5][6M]



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

7. a) Discuss JFET Fixed Bias with neat diagram and derive the expression for Input impedance, Output impedance and Voltage gain. [L3][CO5][8M]
   b) Compare n channel JFET with p channel JFET. [L3][CO5][2M]
8. a) Draw the circuit diagram of JFET Common Source amplifier with voltage divider bias for bypassed R_s and determine the expression for input impedance, output impedance and voltage gain. [L2][CO5][5M]
   b) For Common Drain Amplifier as shown in the Figure, $g_m = 2.5mS$, $r_d = 25K\Omega$. Calculate Input impedance, Output impedance and Voltage gain. [L4][CO5][5M]



9. List and explain the steps involved in the manufacturing process of monolithic ICs. [L2][CO5][10M]
10. Discuss CMOS fabrication process with neat diagram. [L1][CO5][10M]

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