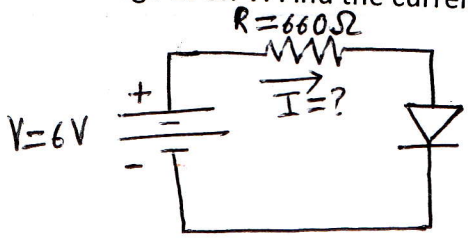
Question collection for EDC (Electronic Devices and Circuits)

CHAPTER1- DIODES

1. What is P-N junction diode? Explain the large signal models of P-N junction diode.
2. Describe with the help of loadline and IV characteristics of the diode, a simple circuit that uses pn junction diode in forward biased state.
3. Define modeling. Explain the small signal model of a semiconductor diode with necessary figure and derive the expression for AC or dynamic resistance.
4. In the given circuit, the diode used has its n=1.74 and it conducts 1mA at forward bias voltage of 0.7V. Find the current flow in the given circuit.

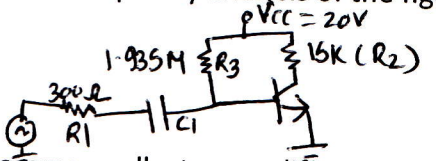


5. A diode conducts 1mA at 20° C. If it is operated at 100 °C, what will be its current? Given data are n=1.8 and negative temperature coefficient value is -1.8mv/°C.
6. Draw graphs of IV characteristics of ordinary PN junction diode and zener diode. Prove that the diode voltages changes by $2.3nV_T$ when diode current changes by 10 times. Find the value of dynamic resistance if voltage in the diode is 650 mV and I_{RS} is 10 pA. (Given n=2 and V_t = 25 mv.)
7. Define and Explain reverse break down effect.

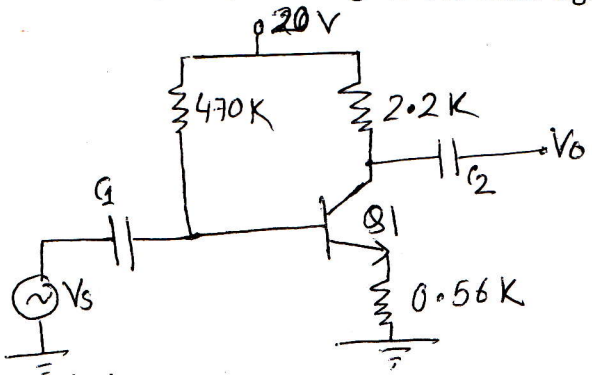
CHAPTER2 - BIPOLAR JUNCTION TRANSISTORS

8. Why common collector amplifier is also called emitter follower? Draw the common collector transistor amplifier circuit and find its input impedance, output impedance .
9. Draw the common collector transistor amplifier circuit and find its current gain, voltage gain.
10. Draw and describe the Ebers Moll model for BJT.
11. Describe in brief the operation of BJT as a switch in cut off and saturation region.
12. Design a voltage divider type dc biased common emitter amplifier to obtain β independent biasing. Use appropriate guidelines to support your design. Given parameters are: V_{CC} = 12 VDC, I_C = 2 mA and β=150.
13. Design common base amplifier using β-independent dc biasing method. Use appropriate guideline to support your design. Given parameters are: V_{CC} = 24 V dc, I_C = 1mA and β=200. Also find its voltage gain by using its ac equivalent circuit.
14. Draw Ebers Moll Model, low frequency π-model and simple T-model for BJT.

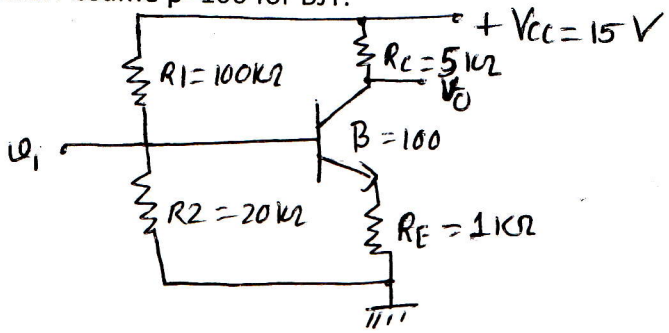
15. Draw and explain the A.C. and D.C. equivalent circuit of transistor amplifier biased by potential divider method, having source resistance (R_S) and load resistance (R_L)
16. Determine the hybrid π model for low frequency analysis of the figure shown below. Given β=100.



17. Draw the small signal model for common collector amplifier and find its input resistance and voltage gain.
18. Design β independent type dc biased common emitter amplifier circuit. Given paramenters are: V_{cc}=24 V_{DC}, I_C =1.5mA, β=150, and input impedance is comapartively large. Use appropriate guidelines to support your design. Also determine its voltage gain.
19. For the figure shown below with β= 120 find the a) input impedance b) Output impedance c) voltage gain d) current gain. Use Small signal model.



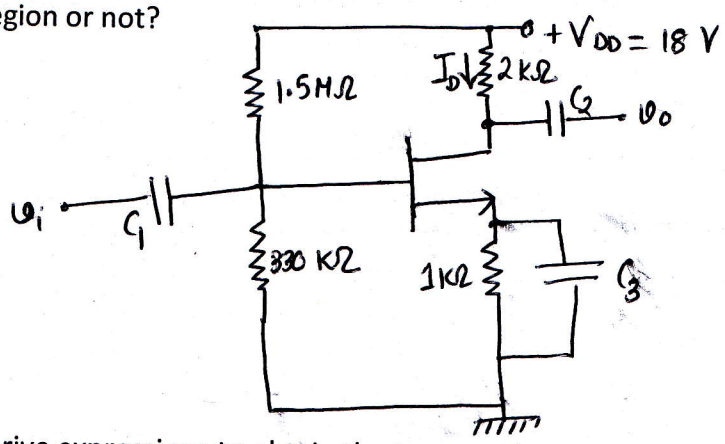
20. Draw the ac equivalent circuit of given circuit and find its input and output resistances. Assume β=100 for BJT.



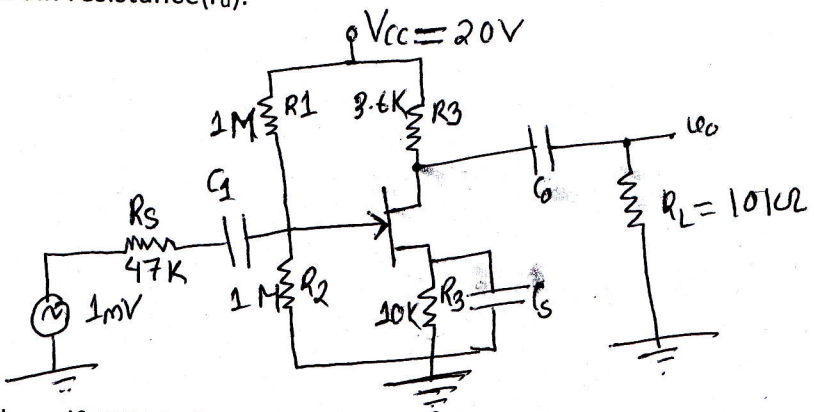
21. Define transconductance (gm). Derive gm for BJT.
22. Design β-independent type dc biased common collector amplifier, and find its current gain and input resistance. Given parameters are: V_{CC} = 20 V, I_C = 2mA, β=100 and use firm biasing method.
23. Derive an expression to find the output resistance for emitter unbybassed common emitter amplifier circuit.

CHAPTER 3- FET (FIELD EFFECT TRANSISTORS)

24. Find I_D and V_{DS} for the given circuit. Given data are: V_p= -5.5V, I_{DSS} = 12 mA and assume all capacitors are ideal and check whether transistor is operating in pinch off region or not?

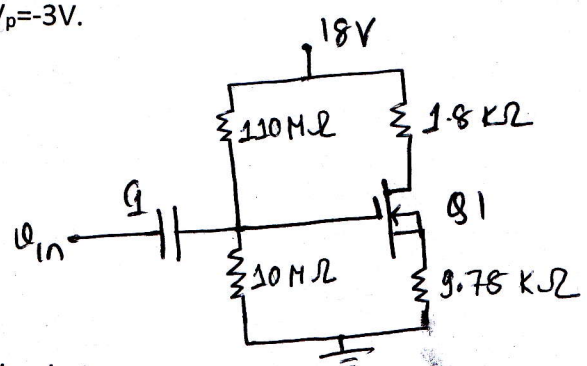


25. Derive expressions to obtain the transconductance of BJT,JFET and MOSFET.
26. Draw ac equivalent models of BJT, JFET and MOSFET depicting the transconductance parameter.
27. Describe the construction and working principle of EMOSFET with help of drain characteristics curve and mathematical expressions.
28. Describe the construction and working principle of N-channel JFET with the help of drain and transfer characteristics graphs. Find the condition for it to operate in active and pinch-off modes of operation and derive expressions for current in both modes.
29. Describe self-biasing and voltage divider biasing methods for N-JFET.
30. Derive an expression to obtain transconductance of MOSFET.
31. An n-channel JFET has a pinch-off voltage of -4.5V and I_{DSS} =9 mA. At what value of V_{GS} will I_{DS} be equal to 3mA.? What is g_m at this I_{DS} ?
32. What is the significant difference between the construction of an enhancement type MOSFET and depletion type MOSFET ? Also explain different operating regions in the characteristics curve of depletion type MOSFET with proper reasoning.
33. Figure below shows the circuit of a common source FET amplifier. Determine the value of output voltage, input impedance and output impedance. Take g_m=5000μS. Neglect drain resistance(r_d).

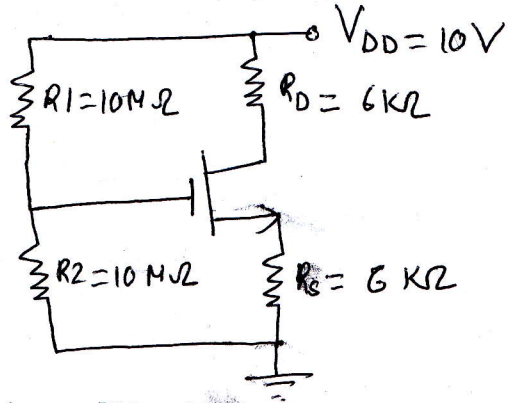


34. Explain why self DC biasing MOSFET circuit is better than fixed DC biasing MOSFET circuit. 7

35. For the n-channel D-MOSFET as shown below. Find I_{DQ} and V_{GSQ}. Given that I_{DSS}=6mA and V_p=-3V.



36. Find the drain current I_D and drain to source voltage (V_{DS}) for the following circuit. Given parameters are: V_t=1V and k=0.5mA/V².



37. State the differences between BJT and FET.

Chapter 4: Power Supplies, Breakdown Diodes, and Voltage Regulators

1. Draw the circuit diagram of a standard dc series regulator using discrete components and estimate its voltage stability.
2. Define the regulated power supply. Determine the voltage stability (input regulation) factor of variable series voltage regulator circuit with transistor Q2 as error amplifier.
3. Draw series voltage regulator with current limiting circuit with explanation of function of this protection circuit. Explain the operation of protection network.
4. Design a regulator circuit to obtain 16VDC with input voltage 25VDC.
5. Describe the bandgap voltage reference source with the help of a relevant circuit.
6. Define constant voltage source and constant current source. And, draw two working circuits one for each source.
7. Design a DC volatge regulator to obtain 16VDC/1A with the input voltage of 25V (average value).

Chapter 5: Output Stages and Power Amplifiers

8. A class B push pull amplifier is providing 20V peak signal (sinewave) to a 16Ω load (speaker) and power supply is Vcc=30V. Determine the input power, output power and circuit efficiency.

9. How does the crossover distortion occur in class B amplifier? What will you do to eliminate crossover distortion?
10. Derive general and minimum efficiency of class B power amplifier.
11. Determine general efficiency of class A power amplifier with resistive load and transformer load.
12. Calculate the efficiency of a transformer coupled class A amplifier for a supply of 12VDC and output of (i) Vp=12V and ii)Vp=6V.
13. Derive general efficiencies of class A and class B amplifiers.
14. Draw transformer coupled class B amplifier with its corresponding characteristic graph. And show that maximum efficiency is 25π%.
15. When are tuned amplifiers used ? Draw tuned amplifier circuit and its corresponding graph to show cut off points. And determine the 3dB bandwidth of the amplifier.
16. Draw class A tuned amplifier circuit. And, derive its resonant frequency and 3dB bandwidth.
17. How will you achieve very narrow and flat band response from a tuned amplifier?
18. Draw Quasi-complementary symmetry class AB amplifier. Explain its operation indicating how crossover distortion is eliminated in it.

Chapter 6: Signal Generator and Waveform-Shaping Circuits

19. Explain Barkhausen criteria for sinusoidal oscillator. Draw an RC-sinewave oscillator and derive its frequency of oscillation.
20. Draw circuit diagram and explain the operating principle of opamp based relaxation oscillator.
21. Draw triangular wave generator and find its frequency of oscillation.
22. Draw and explain the principle of voltage to frequency converter or VCO oscillator. Express the relationship between voltage and frequency of oscillation.
23. Explain the 555 IC as relaxation oscillator.
24. Explain the operation of 555IC used relaxation oscillator or square wave oscillator. And find its frequency of oscillation.
25. Define and explain principle of oscillator. Design a 2KHz sinewave or square wave oscillator.