UNIT I
PN Diode and Its Applications
Part A

1. Define Doping.
2. What do you understand by extrinsic semiconductor?
3. What are the two types of extrinsic semiconductors?
4. What is meant by unbiased PN junction?
5. What is meant by depletion layer in unbiased PN junction?
6. Define forward static and dynamic resistances of diode.
7. Define diffusion capacitance and transition capacitance.
8. Draw the V-I characteristics of PN junction Diode.
9. Write down the expression for Diode Current.
10. Write any two differences between Zener breakdown and Avalanche breakdown.
11. What is meant by Zener diode?
12. Draw the V-I characteristics of Zener diode.
13. List the applications of Zener Diode.
14. Define the ripple factor for a half-wave and full-wave rectifier.
15. Compare the performance of half-wave rectifier and full-wave rectifier.
16. Define Transformer utilization factor.
17. What are the advantages of Bridge rectifier?
18. How shunt regulator is differentiated from series regulator?
19. Draw the block diagram of shunt voltage regulator.
20. Draw the block diagram of series voltage regulator.
21. Compare the rectifier and regulator.
22. What is meant by LED? What materials are used to construct an LED?
23. Define the following for LED

a) Radiant intensity b) Irradiance

24. Name the different types of LCDs.
25. State any two applications of LCDs.
26. Write the diffusion current expression and state how this current is formed?
27. Write the temperature dependence of reverse saturation current of PN junction diode.
28. Draw the energy band diagram of a semiconductor.
29. Why an LC filter is called load independent?
30. Draw the equivalent circuit of zener diode under proper biased condition.
31. Why a semiconductor acts as an insulator at ordinary temperature?
32. Define valence band and conductance band.
33. Name some donor and acceptor which can be added as impurities in Silicon and Germanium.
34. Differentiate drift current and diffusion current.
35. Why Silicon is preferred over Germanium in the manufacture of semiconductor devices?
36. Define forbidden energy gap.
37. Define forward and reverse recovery time of a diode.
38. Define knee voltage and breakdown voltage with respect to diode.
39. Define mass action law.
40. Define avalanche breakdown and zener breakdown.
41. Write down the advantages of C filter.

42. Design a full wave rectifier with C filter for Vdc = 12 V; IL = 100 mA and ripple factor = 5%.
43. What is meant by mean life time of a carrier in semiconductor?
44. Define peak inverse voltage of diode.
45. Define load regulation and line regulation.
46. What are the limitations of using zener diode regulator?
47. Define filter.
48. What are the types of filter?
49. A 5V battery is connected across the two diodes connected in series opposing.Find the voltage drop across each diode at room temperature.

Part B

1. Explain the operation of forward biased and reverse biased PN junction Diode.

2. (i) Explain the current components in a PN junction diode. (ii) Derive the diode current equation.

3. (i) Briefly explain about avalanche and zener breakdown.
(ii)Draw the display of number 1 using seven segment display and explain the theory of liquid crystal cells.

4. Explain the working of Bridge rectifier. Give the expressions for RMS current, PIV, ripple factor and efficiency.

5. Describe the working principle of full wave rectifier and derive the expressions for the ripple factor, efficiency, VDC , IRMS, ILmax and VRMS.

6. Draw the block diagram of series and shunt voltage regulator and explain the operation of series & shunt voltage regulator.

7. Explain the alpha numeric display configuration using LEDs and describe its working.

8. (i)Describe the working of LC filter. (ii)Explain V-I characteristics of Zener diode.

9. (i) Briefly explain the operation of multiple LC filter.
(ii) Explain the operation of π section filter with bridge rectifier and also derive an expression for its stability factor.

10. (i) Explain about the switching characteristics of the diode.
(ii) Explain about the effect of temperature on diode characteristics.

UNIT II
BJT and its Applications

Part- A

1. What is transistor? Give its circuit symbol.
2. In a transistor operating in the active region although the collector junction is reverse biased the collector current is quite large. Explain.
3. What is reverse saturation current?
4. Define α and β.
5. What is meant by punch through effect?
6. If the base current in a transistor is 30 micro amps when the emitter current is 2 m A. What are the values of α and β?
7. Give the relation between α and β.
8. Draw the hybrid model for transistor.
9. Define the various h-parameters in a transistor.
10. List some applications of BJT.
11. Define cutoff and active region of a transistor.
12. Draw the output characteristics of a transistor in CE configuration.
13. Draw the small signal low frequency hybrid model of common base configuration.
14. What is optocoupler?
15. Mention two advantages of optocouplers.
16. Why base made thin in BJT?
17. Among CE, CB and CC configurations which is most popular? Why?
18. Define Base Width modulation.
19. What is meant by biasing a transistor?
20. In a common base connection, the emitter current is 1 mA, ICBO = 50 μ A, α = 0.92.Find the total collector current.
21. Describe how amplification and switching achieved by a BJT?
22. What are the bias conditions of base-emitter and base-collector junction to operate a transistor in cut off region?
23. Define the current ICEO.
24. Why is emitter follower so named?
25. What do you understand by h-parameters?
26. What is the significance of h-parameters?
27. Which factors determine the switching speed of the transistor?
28. What are the limitations of switching parameter?
29. What is the need for small signal model of BJT?
30. Differentiate between rise time and storage time?
31. What are the factors that contribute to the delay time when the transistor is used as a switch?
32. Differentiate small signal model with large signal model.
33. Draw the ebers-moll model of CE transistor circuit.

Part B

1. Draw and explain the input and output characteristics of a transistor in CE configuration.

2. (i) Explain the operation of Power transistor.
(ii) Describe two applications of BJT.

3. Draw and explain the input and output characteristics of a transistor in CB configuration.

4. (i) Explain the working of NPN and PNP transistor.
(ii) With neat diagram, describe the principle and working of Optocoupler.

5.With necessary circuit and waveform, explain the switching characteristics of a transistor in detail.

6. (i) Distinguish between the different types of transistor configurations with necessary circuit diagrams.
(ii) With neat sketch, explain low frequency and high frequency model of a transistor.

7.Draw and explain the input and output characteristics of a transistor in CC configuration.

8.Derive the expression for AI, AV, Ri and Ro for CB amplifier using h-parameter model.

9.Derive the equations for voltage gain, current gain, input impedance and output admittance for a BJT using low frequency h-parameter model for
(a) CE configuration (b) CB configuration and (c) CC configuration.

10.(i)The h-parameters of a transistor are given below. The source and load resistances of a CE amplifier are equal to 2 kΩ.Compute AV, Ri and RO.
(ii)If the common-emitter h –parameters of a transistor are given by hie = 2000 Ω ,hfe = 49, hre = 5.5x10-4 and hoe = 2.5x10-5, find the common base h-parameters of the transistor.

UNIT III

FET and its Applications

Part- A

1. What are the features of JFET?
2. What is meant by Pinch-off voltage?
3. Define amplification factor.
4. Draw the symbol of JFET.
5. Define drain resistance and Transconductance.
6. Write Shockley's equation.
7. What are the applications of JFET?
8. What are the precautions to be taken when handling MOSFET?
9. What are the differences between BJT and JFET?
10. What are the differences between JFET and MOSFET?
11. Depletion MOSFET is commonly known as "Normally-on" MOSFET. Why?
12. What are the parameters of JFET?
13. Draw the symbol for
    i) P-channel JFET, iii) N-channel JFET
    ii) P-channel depletion MOSFET iv) N-channel depletion MOSFET
14. What is Darlington connection?
15. Draw small signal model of Common source amplifier.
16. Define threshold voltage of a MOSFET.
17. Why noise level in FET is smaller than BJT?
18. Why the input impedance in FET is very high in comparison with BJT?
19. Why is FET preferred as a Buffer Amplifier?
20. In a n-channel JFET, IDSS = 20 m A and VP = -6 V. Calculate the drain current when VGS = -3 V.
21. Determine the transconductance of a JFET if its amplification factor is 96 and drain resistance is 32 KΩ.
22. What are the different types of MOSFET?
23. What is the major difference in construction of the D-MOSFET and the E-MOSFET?
24. What are the applications of MOSFET?
25. What is meant by cascade connection?
26. What is meant by cascode connection?
27. State the uses of the MOS diode.
28. Give the relationship between different JFET parameters?
29. Draw the transfer characteristics for JFET and N-Channel MOSFET.

Part B

1. Explain with the help of neat diagrams, the structure of an N-channel FET and its Volt-ampere characteristics. In what ways it is different from a bipolar transistor.

2. Describe the construction and explain the operation of depletion mode MOSFET. Also draw the static characteristics.

3. Explain the working of a P channel JFET and draw the V-I characteristics of it.

4. (i)Compare N-with P-channel MOSFETS. (ii)Compare P-channel JFET with N-channel JFET.

5. (i)Compare JFET and MOSFET?
(ii)With neat diagram, explain the working of Darlington connection.

6. (i) Draw and explain the small signal model of common drain amplifier. (ii) Draw and explain the small signal model of common gate amplifier.

7. Describe the kind of operation that takes place in the enhancement mode MOSFET. How does this differ from depletion mode type?

8. (i) Draw and explain the small signal model of common source amplifier. (ii) Write short notes on threshold voltage and gate capacitance.

9. (i) Explain the performance of FET as a voltage variable resistor
(ii) Define and explain the three parameters of a JFET give the relation between them.

10. (i) Show that if a FET is operated at sufficiently low drain voltage, it behaves as a resistance R given by R = R0 / [1- (VGS / VP)1/2] Where R0 is the channel resistance for zero gate voltage.
(ii) Obtain low frequency and high frequency model for FET.

UNIT IV

Amplifiers and Oscillators

Part- A

1. What is an oscillator?
2. What are sustained oscillations?
3. What is Piezo electric effect?
4. Why quartz crystal is commonly used in crystal oscillator?
5. Why is an RC phase shift oscillator called so?
6. Name three high frequency oscillators.
7. Distinguish between LC and RC oscillator.
8. What are the different feedback topologies?
9. What are the effects of negative feedback?
10. Name two low frequency oscillators.
11. What are the advantages of crystal oscillator?
12. Which oscillator uses both positive and negative feedback?
13. What are the different types of feedback depending in the type of feedback signal?
14. Define Barkhausen criterion.
15. Distinguish between series and shunt feedback.
16. Define desensitivity factor.
17. Why is negative feedback employed in high gain amplifiers?

18. What is feedback amplifier?
19. How does a oscillator differ from an amplifier?
20. Mention the expression for frequency of oscillation for a hartley oscillator.
21. Mention two reasons why LC oscillator is preferred over RC oscillator at radio frequency.
22. What is sustained oscillation?
23. What are the essential parts of an oscillator?
24. Define CMRR.
25. What is differential amplifier?
26. Determine the voltage gain of the negative feedback amplifier whose open loop gain is -150 and 7% of the output is feedback.
27. What are the factors needed to choose type of oscillators?

Part B

1. Draw the circuit diagram of a current series feedback amplifier and derive expressions for voltage gain with and without feedback.

2. With a neat sketch explain the working of an RC phase shift oscillator and derive an expression for frequency of oscillation for an RC phase shift oscillator.

3. Explain the working of Colpitt's oscillator and derive an expression for frequency of oscillation for Colpitt's oscillator.

4. (i)Write short notes on LC oscillator. (ii)Write short notes on crystal oscillator.

5. Briefly analyse the performance measures of negative feedback amplifiers.

6. Explain in detail about the different feedback topologies.

7. Draw the circuit diagram of a voltage series feedback amplifier and derive expressions for voltage gain with and without feedback.

8. Briefly explain about differential amplifiers.

9. (i) Write notes on frequency stability of an oscillator.
(ii) A negative feedback of $\beta = 0.01$ is applied to an amplifier of gain 500. Calculate the change in overall gain of the feedback amplifier if the internal amplifier is subjected to a gain reduction of 10 %.

10. (i) (a)An amplifier has a voltage gain of 50 dB with an negative feedback and with a feedback ratio of 1 / 10.Calculate the gain with feedback. (b)The voltage gain of an amplifier without feedback is 50 dB. If it is reduced to 30 dB with feedback, calculate the feedback factor.
(ii) Write notes on Wien bridge oscillator.

UNIT V

Pulse Circuits

Part- A

1. Give the definition for Clipper.
2. What are the applications of Clippers?
3. What is Clamper?
4. What is Astable multivibrator?
5. How a Schmitt trigger is different from a multivibrator?
6. What is a blocking oscillator?
7. What are the applications of Schmitt trigger?
8. What are the applications of Multivibrator?
9. What is Monostable multivibrator?
10. What is Bistable multivibrator?
11. What do you meant by the term "Wave shaping"?
12. What is the difference between positive and negative clippers?
13. Draw neatly the circuit diagram of a voltage quadrupler.
14. What are the applications of clamping circuits?
15. Draw a practical Clamper circuit.

Part B

1. With the help of circuit diagram, describe the operation of a clipper that can clip at two independent levels.

2. With a neat sketch, explain the working of an astable multivibrator.

3. With a neat sketch, explain the working of an Bistable multivibrator.

4. Explain the difference between the three types of multivibrators.

5. Draw the circuit diagram of Schmitt trigger circuit and explain its operation with waveforms.

6. Explain the working of UJT based saw tooth oscillators.

7. With a neat sketch, explain the working of an Monostable multivibrator.

8. What do you understand by clamping circuits? Discuss with the help of waveforms, the operation of a clamping circuit to clamp a sine wave input positively at 0 V.

9. (i)Enumerate the conditions under which an RC circuit behaves as an integrator. (ii)Discuss the necessary criteria for a good differentiating circuit. Give some applications of this circuit.

10. Explain about the triggering methods for Bistable multivibrator