

QUESTION BANK
ELECTRONIC DEVICES AND CIRCUITS
YEAR/SEMESTER: I / II
Common to ECE, EEE, CSE, IT, AI

UNIT I
PN Junction Diode
SHORT ANSWER QUESTIONS (PART-A):

1. What are solid state materials?
2. What is Doping?
3. What is P-type and N-type semiconductor?
4. What is Diffusion?
5. What is meant by depletion region?
6. Define Knee voltage/cut-in voltage of a conventional diode.
7. What is reverse breakdown voltage?
8. State Reverse saturation current.
9. Draw forward bias and reverse bias of PN junction diode circuits
10. Define the Static and Dynamic Resistances of a PN Junction diode.
11. Write down the equation of PN Junction diode current.
12. Draw the ideal and practical equivalent circuit of PN Junction diode.
13. Define Transition and Diffusion Capacitances of a PN Junction diode?
14. What are the applications of PN Junction diode?
15. Diode is a bidirectional device (True or False)
16. A reverse-biased diode has _____ resistance
17. A forward biased diode has _____ resistance
18. Why diode is called a switch?
19. Define Storage time and Transit Time?
20. Define Reverse Recovery time?

LONG ANSWER QUESTIONS (PART-B)

1. With neat diagram, explain the operation of PN Junction diode under Forward Bias and Reverse Bias Conditions.
2. a) Sketch and explain the V-I Characteristics of P-N Junction Diode for Forward Bias and Reverse Bias Conditions?
b) Calculate the static and dynamic resistance from V-I Characteristics of P-N Junction Diode.
3. State the following

- i) Depletion region ii) Cut-in voltage iii) Reverse Breakdown Voltage iv) Transition Capacitance v) Diffusion Capacitance
- 4. Explain in detail about transition capacitance C_T for a PN Junction diode.
- 5. Explain in detail about Diffusion capacitance C_D for a PN Junction diode.
- 6. The voltage across a silicon diode at room temperature of 3000K is 0.71V when 2.5mA current flows through it. If the voltage increases to 0.8V, calculate the new diode current.
- 7. With neat diagram, explain Diode Equivalent Circuits in detail.
- 8. With neat sketch, justify how PN Junction diode acts as a switch.
- 9. Explain the switching times of a PN Junction diode with neat sketch.
- 10. State the following
 - i) Forward Bias ii) Reverse Bias iii) Storage time iv) Transition time v) Reverse recovery time

UNIT II

DIODE APPLICATIONS

SHORT ANSWER QUESTIONS (PART-A):

1. What are the applications of PN Junction diode?
2. What is meant by rectifier?
3. List different types of rectifiers?
4. Define Peak Inverse voltage of a diode.
5. Define rms voltage of a rectifier.
6. Define average voltage of a rectifier.
7. What is a ripple factor?
8. Define regulation of a rectifier?
9. State transformer utilization factor?
10. Define efficiency of a rectifier?
11. Compare 3 types of Rectifiers?
12. What is the need for a filter in rectifier?
13. Write ripple factor of capacitor filter.
14. Write ripple factor of inductive filter.
15. What is a clipper?
16. What is the other name of clipper?
17. What is a transfer characteristic?
18. Why clamper is called dc restorer?
19. What is non linear wave shaping?
20. What is the difference between the clipper and clamper?

LONG ANSWER QUESTIONS (PART-B):

1. a) Explain in detail Half Wave Rectifier circuit with neat sketches?
 b) Derive the following in reference to half wave rectifier- Average value of current, rms value of current, ripple factor, rectifier efficiency and PIV?

2. a) Explain in detail center-tapped Full Wave Rectifier circuit with neat sketches?
 b) Derive the following in reference to Full wave rectifier - Average value of current, rms value of current, ripple factor, rectifier efficiency and PIV?
3. Explain in detail Bridge Rectifier circuit with neat sketches?
4. Compare half wave, full wave and bridge rectifier circuits?
5. Explain Full Wave Rectifier with inductive filter circuit and mention the ripple factor?
6. Explain Full Wave Rectifier with Capacitive filter circuit and mention the ripple factor?
7. What is clipper circuit and explain the following
 - (a) Series positive clipper (b) Clipping below the reference voltage
 - (c) Parallel negative clipper (d) Two level clipper
8. State and prove the clamper circuit theorem?
9. What is a clamper and explain positive clamper and negative clamper circuits?
10. Find I_{dc} , I_{rms} , ripple factor, rectifier efficiency and PIV for a full wave center-tapped rectifier for a transformer voltage of 220V with a diode resistance of 20 Ohm and a load resistance of 1kOhm?

UNIT III

Bipolar Junction Transistor (BJT) **SHORT ANSWER QUESTIONS (PART-A):**

1. What is a transistor?
2. Describe the main function of the transistor.
3. Why the transistor is called as bipolar junction transistor?
4. What are the doping levels in the transistors?
5. What are the three types of configuration in transistors?
6. Why is emitter region wider than collector region in BJT?
7. Define Transistor current.
8. Draw the symbol of npn and pnp transistor.
9. Define the different operating regions of transistor.
10. Draw the input and output characteristics of a transistor in CE configuration and mark the cutoff, saturation and active regions.
11. What is early effect or basewidth modulation?
12. Explain how transistor acts as an open switch and closed switch.
13. Explain current amplification factor.
14. What are α , β and γ in a transistor?
15. What is the relation between α , β and γ in a transistor?
16. What is I_{CBO} and I_{CEO} in a transistor what is relation between I_{CEO} , I_{CBO} and I_{CO} ?
17. Why I_{CBO} is greater than I_{CO} ?
18. What is meant by collector leakage current in a transistor?
19. Describe the main factors affecting the value of collector leakage current.
20. In a BJT, the emitter current is 12 mA and the emitter current is 1.02 times the collector current. Find the base current.

LONG ANSWER QUESTIONS (PART-B):

1. Explain construction and working operation of NPN & PNP transistor with neat sketches?
2. a) With neat circuit diagram, explain input and output characteristics of CB configuration of a transistor.
b) Calculate input and output resistance from its characteristics.
3. a) With neat circuit diagram, explain input and output characteristics of CE configuration of a transistor.
b) Find input and output resistance from its characteristics.
4. a) With neat circuit diagram, explain input and output characteristics of CC configuration of a transistor.
b) Find input and output resistance from its characteristics.
5. Describe the significance of the terms, ' α ', ' β ', ' γ ' and establish a relation between them.
6. Write the differences between CB, CE, and CC transistor Configurations.
7. A Si NPN Transistor With $\alpha=0.995$ And $I_{CO}=15 \mu A$, $I_B=20 \mu A$ in the CE Configuration. What is value of I_C ?
8. Determine the collector current of a BJT with both of its junctions Reverse Biased. Assume $I_{CO}=5 \mu A$, $I_{EO} = 3.58 \mu A$, $\alpha = 0.98$ And Any Other Parameter Values as Required?
9. Explain switching times of transistor with neat sketches.
10. Explain following terms.
 - a) Doping
 - b) Basewidth Modulation
 - c) Amplification factor
 - d) Transistor as a switch

UNIT IV

FIELD EFFECT TRANSISTOR (FET) SHORT ANSWER QUESTIONS (PART-A)

1. Draw the symbols of N-Channel JFET, P- Channel JFET,
2. Draw the symbols of N-CH E-MOSFET, P-CH E-MOSFET,
3. Draw the symbols of N-CH D-MOSFET, P-CH D-MOSFET?
4. A JFET is also called transistor (Unipolar/Bipolar/Unijunction /none)
5. JFET is a controlled device(current/voltage/both current and voltage/none)
6. The gate of a JFET is biased(reverse/forward/reverse as well as forward/none)
7. The input impedance of a JFET is (very high/low/very low/zero)
8. In a p-channel JFET, the charge carriers are(electrons/holes)
9. If the reverse bias on the gate of a JFET is increased, then width of the conducting channel
.....
10. When drain voltage equals the pinch-off-voltage, then drain current with the increase in drain voltage(increases/decreases/constant/zero)
11. In a JFET, I_{DSS} is known as (drain to source current/drain to source current with gate shorted/drain to source current with gate open/none of the above)
12. The channel of a JFET is between the(gate and drain/drain and source/gate and source/input and output)
13. The Shockley equation is _____
 - a) $I_D = (1 - V_{gs}/V_p)^2$
 - b) $I_D = I_{DSS} (1 - V_{gs}/V_p)^2$
 - c) $I_D = I_{DSS} (1 - V_{gs}/V_p)$
 - d) $I_D = I_{DSS} (1 + V_{gs}/V_p)^2$
14. The relation between amplification factor(μ), transconductance (g_m) and dynamic output resistance (r_d) is
 - a) $\mu = r_d \times g_m$
 - b) $\mu = r_d / g_m$
 - c) $\mu = r_d - g_m$
 - d) $\mu = r_d + g_m$
15. What does MOSFET stands for?

16. With the E-MOSFET, when gate input voltage is zero, drain current is (saturation/zero/ I_{DSS} / widening the channel)
17. With a JFET, a ratio of output current change against an input voltage change is called as(trans conductance/ Siemens/ resistivity/ gain)
18. A MOSFET is sometimes called JFET(many gate/open gate/insulated gate/shorted gate)
19. In which MOSFET physical channel exists?(D-MOSFET/E-MOSFET)
20. The voltage at which the drain current increases in E-MOSFET is called---(pinchoff voltage(V_p)/ Threshold voltage(V_{th})/ Gate voltage(V_G)/ Drain to Source voltage(V_{ds}))

LONG ANSWER QUESTIONS (PART-B)

1. Explain construction and the operation of N-channel JFET with the help of drain characteristics and transfer characteristics?
2. A) Compare BJT and FET?
B) Define i) Pinch-off Voltage ii) I_{DSS}
3. Explain the construction of an N-channel MOSFET of Depletion type and draw its characteristics?
4. Explain the construction of an N-channel MOSFET of enhancement type and draw its characteristics?
5. A) Describe how a FET can be used as a Voltage Variable Resistance (VVR).
B) How MOSFET can work as a capacitor?
C) Establish A Relation Between the Three JFET Parameters, μ , R_d And G_m ?

UNIT V

SPECIAL PURPOSE DEVICES

SHORT ANSWER QUESTIONS (PART-A)

1. In a Zener regulator, the change in load current produces, change in _____. (zener current)
2. Identify the device that can be used to regulate voltage in an electrical system. (Zener Diode)
3. A zener diode, when used in voltage stabilization circuits, is biased in _____. (Reverse breakdown region)
4. In which of the diode characteristics the negative resistance region is present. (Tunnel Diode)
5. What is Tunneling. (A direct flow of electrons across the small depletion region from n-side conduction band into the p-side valence band)
6. _____ device has a four layer p-n-p-n construction. (SCR)
7. Mention applications of SCR. (Switching, Power (AC & DC) control, Over-voltage protection, Battery charging regulator)
8. Mention the terminals of UJT. (Base1, Base2, Gate)
9. Express the Intrinsic StandOff Ratio(η) of UJT. ($\eta = RB1/(RB1+RB2)$)
10. Write any two Applications of Varactor Diode.
11. What are the operating regions of UJT? (Cut off region, Negative resistance region, Saturation region)
12. The presence of dark current decreases the sensitivity of the photodiode to light(T/F)? True
13. _____ diode is used to detect the optical signal. (Photo Diode)
14. In a photodiode, when there is no incident light, the reverse current is almost negligible and is called _____. (Dark Current)
15. The colour of emitted light from LED depends on? (Type of semiconductor material used)
16. When forward biased, LED emits light because of _____. (Recombination of carriers)
17. Schottky diodes are also known as _____. (hot carrier diodes.)
18. You have an application for a diode to be used in a FM tuning circuit. A type of diode to use might be _____. (a varactor)
19. The principle of a solar cell is same as the photodiode(T/F)? (True)
20. What is the difference between Photodiode and Solar cell? (No External Bias in Solar cell)

LONG ANSWER QUESTIONS (PART-B):

1. a) How is Zener diode act as a Voltage Regulator?
b) Explain the V-I Characteristics of Zener Diode.

2. a) Draw the symbol and equivalent circuit of a UJT.
b) Explain the operation of UJT with the help of its V-I characteristics?
3. a) Describe the Construction and Principle of Operation of SCR.
b) Explain the V-I Characteristics of a SCR.
4. a) Explain the V – I Characteristics Of a Tunnel Diode With the Help Of Energy Band Structure ?
b) Write short notes on Varactor Diode.
5. a) Describe the Construction and Principle of Operation of Schottky diode
b) Explain the V-I Characteristics of a photo diode