



PHYSICS

BOOKS - BITSAT GUIDE

SEMICONDUCTOR DEVICES AND LOGIC GATES

Practice Exercise

1. If the resistivity of copper is $1.7 \times 10^{-6} \Omega cm$, then the mobility of electrons in copper, if

each atom of copper contributes one free electron for conduction, is [The atomic weight of copper is 63.54 and its density is 8.96g/cc]:

A. $23.36\text{ cm}^2/\text{Vs}$

B. $503.03\text{ cm}^2/\text{Vs}$

C. $43.25\text{ cm}^2/\text{Vs}$

D. $88\text{ cm}^2/\text{Vs}$

Answer: C



Watch Video Solution

2. The conductivity of a semiconductor increases with increase in temperature because

A. Number density of free current carriers increases

B. relaxation time increases

C. both number density of carriers and relaxation time increases

D. number density of current carriers increases, relaxation time decreases but effect of decreases in relaxation time is much less than increase in number density.

Answer: D



Watch Video Solution

3. In a n -type semiconductor, which of the following statement is true?

A. Electrons are majority charge carriers

and triavalent atoms are the dopants.

B. Electrons are minority charge carriers

and pentavaent atoms are the dopants.

C. Holes are minority charge carriers and

pentavalent atoms are the dopants

D. Holes are majority carriers and trivalent atoms are the dopants.

Answer: C



Watch Video Solution

4. Application of a forward bias to a $p - n$ junction:

A. Increases the number of donors on the n-side

B. Increase the electric field in the depletion zone

C. Increase the potential difference across the depletion zones.

D. widens the depletion zone

Answer: A



Watch Video Solution

5. In a three phase full-wave rectifier of 50Hz, the ripple frequency is

A. 300 Hz

B. 50 Hz

C. 400 Hz

D. 600 Hz

Answer: A



Watch Video Solution

6. What is the dimensional formula of \sqrt{LC} ?

A. $(s)^2$

B. volt-s/amp

C. amp-s/volt

D. s

Answer: D



Watch Video Solution

7. Given, $\beta = 49$ and $I_e = 2\text{ma}$, I_c for a BJT is

A. 2 mA

B. 1.96 mA

C. 98 mA

D. $\frac{2}{49}$ mA

Answer: B



Watch Video Solution

8. A single ended class A transformer coupled amplifier delivers a power of 50 mW, *[Math Processing Error]* = 10 volts. Assuming ideal

conditions, the reflected primary resistance is given by

A. 2000Ω

B. 1000Ω

C. 500Ω

D. 200Ω

Answer: B



Watch Video Solution

9. In a vacuum diode, when the plate voltage is 40 V, the plate current is 10 mA. For a plate voltage of 160 V, the plate current is

A. 20 mA

B. 40 mA

C. 80 mA

D. 160 mA

Answer: C



Watch Video Solution

10. A triode is operating at $E_c = -4V$, $E_b = 175 V$ and $I_b = 10 \text{ mA}$. Around this operating point, the plate characteristics are linear and the parameter values are $\mu = 20$, $g_m = 2.5 \text{ mA/V}$. If E_c is changed to $-6V$ with $E_b = 175 V$, the value of I_b is given by

A. 10 mA

B. 20 mA

C. 15 mA

D. 5 mA

Answer: D



Watch Video Solution

11. Given the following set of values for a triode, the value of g_m and μ are given below in the table.



- A. 1.25 mA/V and 8
- B. 0.8 mA/V and 8
- C. 1.25 mA/V and 10

D. 8 mA/V and 10

Answer: C



Watch Video Solution

12. The table values of E_b , E_c , I_b for a triode



The value of r_p in $k\Omega$ and g_m in mA/V are given

by

A. 50 and 0.1

B. 10 and 3.0

C. 5 and 1.5

D. 3.33 AND 1.5

Answer: D



Watch Video Solution

13. A Triode is operating at $E_c = -4\text{V}$, $E_b = 175\text{ V}$ and $I_b = 10\text{mA}$. Around this operating point, the plate characteristics are linear and the parameters are $\mu = 20$, $r_p = 8\Omega$. E is changed to

– $6V$. To obtain the same plate current the value of E_b should be

A. 40

B. 135

C. 191

D. 215

Answer: D



Watch Video Solution

14. A triode has $r_p = 10\Omega$ and $\mu = 20$. Table gives the operating point with blanks.



The values of E_{b1} and E_{c1} are

- A. 290 V, $-6V$
- B. 210 V, $-10V$
- C. 290 V, $-10V$
- D. 210 V, $-6V$

Answer: D



Watch Video Solution

15. For a vacuum triode, the values of E_c , E_b and l_b are given as under



The values of μ and r_p are given by

A. $\mu = 12, r_p = 10k\Omega$

B. $\mu = 12, r_p = 20k\Omega$

C. $\mu = 10, r_p = 20k\Omega$

D. $\mu = 20, r_p = 10k\Omega$

Answer: D



Watch Video Solution

16. The temperature (T) dependence of resistivity (ρ) of a semiconductor is represented by :

A. 

B. 

C. 

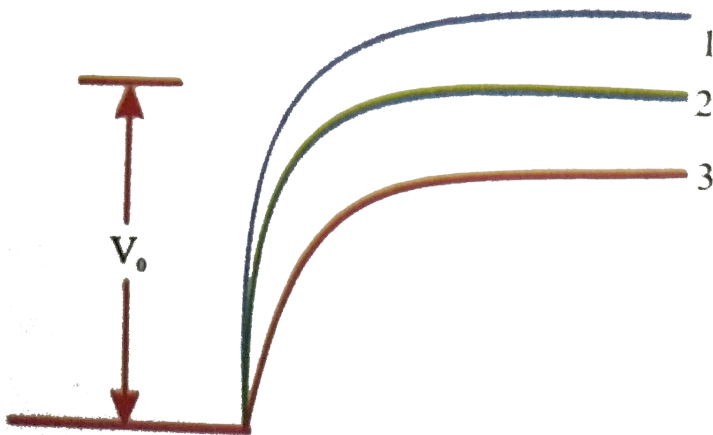
D. 

Answer: C



Watch Video Solution

17. In Fig. V_0 is the potential barrier across a $p - n$ junction, when no battery is connected across the junction :



A. 1 and 3 both correspond to forward bias of junction

B. 3 corresponds to forward bias of junction and 1 corresponds to reverse bias of junction

C. 1 corresponds to forward bias and 3 corresponds to reverse bias of junction.

D. 3 and 1 both correspond to reverse bias of junction.

Answer: B



Watch Video Solution

18. In BJT, maximum current flows in which of the following?

A. Emitter region

B. Base region

C. Collector region

D. Equal in all the regions

Answer: A



19. A tungsten emitter works at 2500 K. To increase the emission current density by 20%, how much change in the work function is required (Given, $\log 2 = 0.3$, $\log 3 = 0.477$)

A. 0.016 eV

B. 0.039 eV

C. 2.54 eV

D. 0.254 eV

Answer: B



Watch Video Solution

20. In an unbiased p-n junction electrons diffuse from n-region to p-region because :-

A. free electrons in the n-region attract them

B. they move across the junction by the potential difference

C. hole concentration in p-region is more as compared to n-region.

D. All of the above

Answer: C



Watch Video Solution

21. Zener breakdown in a semi-conductor diode occurs when

A. forward current exceeds certain value

B. reverse bias exceeds certain value

C. forward bias exceeds certain values.

D. potential barrier is reduced to zero

Answer: B



Watch Video Solution

22. The voltage gain of an amplifier state is 100. The gain expressed in db is

A. 100

B. 20

C. 40

D. 10

Answer: C



View Text Solution

23. If $A = B = 1$, then in terms of Boolean algebra the value of $A \cdot B + A$ is not equal to.

A. $B \cdot A + B$

B. $B+A$

C. B

D. None

Answer: D



Watch Video Solution

24. The Boolean equation for the circuit given in figure is



A. $Y = \overline{A} \cdot B + C$

B. $Y = \overline{A} \cdot (\overline{B} + \overline{C})$

C. $Y = \overline{A} \cdot (B + \overline{C})$

D. $Y = \overline{A} \cdot (B + C)$

Answer: D



Watch Video Solution

25. In the above circuit, if the polarity is reversed of battery, the current flowing would be

A. 0 mA

B. 2 mA

C. 5 mA

D. 10 mA

Answer: A



View Text Solution

26. The given figure shows a rectifier of alternating current ($f=50$ c/s), the number of

pulses of rectified current obtained in 1s is



A. 50

B. 25

C. 100

D. 200

Answer: C



Watch Video Solution

27. In sample of pure silicon 10^{13} atom / cm^3 is mixed of phosphorus. If all doner atoms are active then what will be resistivity at $20^\circ C$ if mobility of electron is $1200 cm^2 / Volt \text{ sec} :-$

A. $0.5209 \Omega\text{-cm}$

B. $5.209 \Omega\text{-cm}$

C. $52.09 \Omega\text{-cm}$

D. $520.9 \Omega\text{-cm}$

Answer: D

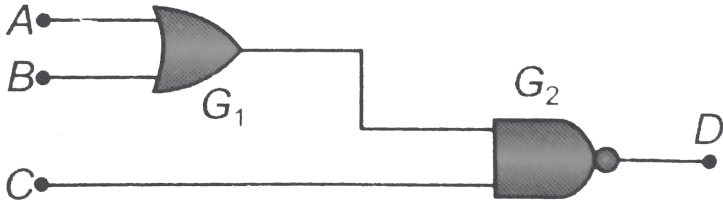


Watch Video Solution

28. For the given combination of gates, if the logic states of inputs A, B, C , are as follows

$$A = B = C = 0 \quad \text{and} \quad A = B = 1, C = 0$$

then the logic states of output D are



- A. 0,0
- B. 0,1
- C. 1,0

D. 1,1

Answer: D



Watch Video Solution

29. The plate voltage of a triode is increased from 225 V to 250 V, the grid voltage is changed from 4 to $-4.7V$ to maintain plate current constant. The amplification factor of the tube is

A. 35.7

B. 2

C. 70

D. 20

Answer: A



Watch Video Solution

30. In a triode amplifier, the load resistance is equal to the plate resistance r_p . If μ is the amplification factor, the stage gain of the amplifier is

A. $\frac{\mu}{2}$

B. μ

C. 2μ

D. $\frac{\mu}{4}$

Answer: A



Watch Video Solution

31. The triodes P and Q have the same amplification factor 40. Their plate resistances are $4k\Omega$ and $8k\Omega$, respectively. If an amplifier

circuit is designed using anyone of them and a load resistance is of $8k\Omega$, the ratio of the voltage gain obtained from them will be

A. 2:3

B. 4:3

C. 3:1

D. 1:2

Answer: B



Watch Video Solution

32. When the plate voltage of a triode is 150 V, its cut-off voltage is $-5V$. On increasing the plate voltage to 200V, the cut-off voltage can be

- A. $-4.5V$
- B. $-5.0V$
- C. $2.3 V$
- D. $-6.66V$

Answer: D



Watch Video Solution

33. In a diode vacuum tube, the plate current is 5 mA, when the plate voltage is 160 V, a grid is introduced between the plate and cathode and a voltage of -2V is applied to it. The plate current will become

(if $g_m = 5 \times 10^{-3} \Omega^{-1}$)

A. 20 mA

B. 10 mA

C. 4 mA

D. 7.5 mA

Answer: C



Watch Video Solution

34. In common emitter amplifier, the $\frac{l_c}{l_e}$ is 0.98, then the value of β is

A. 98

B. 0.98

C. 49

D. None of these

Answer: C



Watch Video Solution

35. For the given circuit of p-n junction diode, which of the following statement is correct?



A. In forward biasing the voltage across R

is V

B. In forward biasing the voltage across R is

2V

C. In reverse biasing the voltage across R is

V

D. In reverse biasing the voltage across R is

2V

Answer: A



Watch Video Solution

36. When forward bias is applied to a $P - N$ junction, then what happens to the potential

barrier V_B , and the width of charge depleted region x ?

- A. V_B increases, x decreases
- B. V_B increases, x increases
- C. V_B increases, x increases
- D. V_B decreases, x decreases

Answer: D



Watch Video Solution

37. Carbon, silicon and germanium atoms have four valence electrons each. Their valence and conduction bands are separated by energy band gaps represented by $(E_g)_C$, $(E_g)_{Si}$ and $(E_g)_{Ge}$, respectively. Which one of the following relationship is true in their case?

A. $(E_g)_C > (E_g)_{Si}$

B. $(E_g)_C = (E_g)_{Si}$

C. $(E_g)_C < (E_g)_{Ge}$

D. $(E_g)_C < (E_g)_{Si}$

Answer: A



Watch Video Solution

38. What is the plate current in a diode valve under the space charge limited operation, when the plate potential is 60 V? In a diode valve, the plate current is 320 mA, then the plate potential is 240 V.

A. 30 mA

B. 20 mA

C. 40 mA

D. 10 mA

Answer: C



Watch Video Solution

39. In the following common emitter configuration, an n-p-n transistor with current gain $\beta = 100$ is used. The output voltage of the amplifier will be



A. 10 mV

B. 0.1 V

C. 1.0 V

D. 10 V

Answer: C



Watch Video Solution

40. In the case of forward biasing of p-n junction, which one of the following figures

correctly depicts the direction of the flow of charge carriers?

A. 

B. 

C. 

D. None of these

Answer: C



Watch Video Solution

41. In a forward biased p-n junction diode, the potential barrier in the depletion region will be of the form

A. 

B. 

C. 

D. 

Answer: D



Watch Video Solution

42. The input resistance of a common emitter transistor amplifier, if the output resistance is $500k\Omega$, the current gain $\alpha = 0.98$ and the power gain is 6.0625×10^6 is

A. 198Ω

B. 300Ω

C. 100Ω

D. 400Ω

Answer: A



Watch Video Solution

43. In a figure given alongside assuming the diodes to be ideal



A. D_1 is forward biased and D_2 is reverse biased and hence, current flows from A to B

B. D_2 is forward biased and D_1 is reverse biased and hence, no current flows from B to A and vice-versa

C. D_1 and D_2 are both forward biased and
hence current flows from A to B

D. D_1 and D_2 are both reverse biased and
hence no current flows from A to B and
vice-versa

Answer: B



Watch Video Solution

44. In the circuit shown in figure, if the diode forward voltage drop is 0.3 V, then the voltage difference between A to B is,



A. 1.3 V

B. 2.3 V

C. zero

D. 0.5V

Answer: B



Watch Video Solution

45. the exclusive -OR of A,B is represented by $A \oplus B$. An equivalent form is

A. $AB + \overline{A}\overline{B}$

B. $AB + \overline{A + B}$

C. $A\overline{B} + \overline{A}B$

D. None of these

Answer: C



Watch Video Solution

46. Given the truth table relating Y to A, B.



The output Y is

A. $A+B$

B. AB

C. $\bar{A}B$

D. $\overline{A + B}$

Answer: D



Watch Video Solution

47. Given the following truth table, where A,B are inputs and Y the output



A. $A\bar{B}$

B. $\bar{A}B$

C. AB

D. $\bar{A}\bar{B}$

Answer: D



Watch Video Solution

48. What will be the input A and B for the Boolean expression $(\overline{A + B}) \cdot (\overline{A \cdot B}) = 1$?

A. 0,0

B. 0,1

C. 1,0

D. 1,1

Answer: A



Watch Video Solution

49. Which of the following gates will have an output of 1 ?

A. 

B. 

C. 

D. 

Answer: C



Watch Video Solution

50. Current in the circuit will be



A. $5/40$

B. $5/50$

C. $5/10$

D. $5/20$

Answer: B



Watch Video Solution

51. Find the value of V_{AB} .



A. 10 V

B. 20 V

C. 30 V

D. None of these

Answer: A



Watch Video Solution

52. A two volt battery forward biased and a diode. However, there is a drop of 0.5 V across the diode which is independent of current. Also, a current greater than 10 mA produces large joule loss and damages diode. If diode is to be operated at 5 mA, then the series resistance to be put is



A. $3\text{ k}\Omega$

B. $300\text{ k}\Omega$

C. 300Ω

D. $200 \text{ k}\Omega$

Answer: C



Watch Video Solution

53. Which of the following statements concerning the depletion zone of an unbiased p-n junction is (are) true?

A. The width of the zone is independent of the densities of the dopants (impurities).

B. The width of the zone is dependent on the densities of the dopants

C. The electric field in the zone is produced by ionised dopant atoms

D. The electric field in the zone is provided by electrons in the conduction band and the holes in the valence band

Answer: B



Watch Video Solution

54. The circuit shown in figure below will act as



- A. OR gate
- B. AND gate
- C. XOR gate
- D. None of these

Answer: A



Watch Video Solution

55. The circuit shown below will act as



A. AND gate

B. OR gate

C. NAND gate

D. XOR gate

Answer: A



Watch Video Solution

56. In Boolean algebra, $A + B = Y$ implies that

A. sum of A and B is Y

B. Y exists when A exists or B exists or both
A and B exist

C. Y exists only when A and B both exist

D. Y exist when A or B exist but not when
both A and B exist

Answer: D



Watch Video Solution

57. In the Boolean algebra, the following one is wrong

A. $1+0=1$

B. $0+1=1$

C. $1 + 1 = 1$

D. None of these

Answer: A



Watch Video Solution

58. The output of a 2-input OR gate is fed to a NOT gate, the new gate obtained is

A. OR gate

B. NOT gate

C. NOR gate

D. XOR gate

Answer: C



Watch Video Solution

59. Digital circuit can be made by the repetitive use of

A. OR gate

B. AND gate

C. NOT gate

D. NAND gate

Answer: D



Watch Video Solution

1. The circuit is equivalent to



A. AND gate

B. OR gate

C. NOT gate

D. None of these

Answer:



Watch Video Solution

2. Active state of n-p-n transistor, in circuit is achieved by

- A. low input voltage
- B. high input voltage
- C. both a and b
- D. Neither a nor b

Answer: D



Watch Video Solution

3. If a semiconductor has an intrinsic carrier concentration of $1.41 \times 10^{16} / m^3$ when doped with $10^{21} / m^3$ at room temperature will be

A. 2×10^{21}

B. 2×10^{11}

C. 1.41×10^{10}

D. 1.41×10^{16}

Answer: D



Watch Video Solution

4. Two identical capacitors each of capacitance C are charged to the same potential V and are connected in two circuits (i) and (ii) at $t=0$ as shown. The charges on the capacitor at $t=CR$ are



A. $\frac{CV}{e}, \frac{CV}{e}$

B. CV, CV

C. $\frac{VC}{e}, VC$

D. $VC, \frac{VC}{e}$

Answer: C



Watch Video Solution

5. A transistor is preferable to a triode valve when used in amplifier because it

- i) Can withstand large changes in temperatures
- ii) has a higher input impedance
- iii) can handle larger powers
- (iv) does not require powers

Which of the above statements is correct?

A. Only (i), (ii), and (iii) are correct

B. Only (i), and (iii) are correct

C. Only (ii) and (iv) are correct

D. Only (vi) is correct.

Answer: D



Watch Video Solution