



PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

SEMICONDUCTOR

Physics

1. A change of 8.0 mA in the emitter current brings a change of 7.9mA in the collector current. How much change in the base current

is required to have the same change 7.9 mA in the collector current? Find the values of α and β .

A. 0.99, 90

B. 0.96, 79

C. 0.97, 99

D. 0.99, 79

Answer:



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2. A pure semiconductor has equal electron and hole concentration of $10^{16} m^{-3}$. Doping by indium increases number of hole concentration n_h to $5 \times 10^{22} m^{-3}$. Then, the value of number of electron concentration n_e in the doped semiconductor is

A. $10^6 / m^3$

B. $10^{22} / m^3$

C. $2 \times 10^6 / m^3$

D. $2 \times 10^9 / m^3$

Answer:



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3. Mention the important considerations required while fabricating a p-n junction diode to be used as light emitting diode (LED). What should be the order of the band gap of an LED if it is required to emit light in the visible region.

A. 0.1 eV to 0.4 eV

B. 0.5 eV to 0.8 eV

C. 0.9 eV to 1.6 eV

D. 1.7 eV to 3.0 eV

Answer:



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4. A common emitter amplifier has a voltage gain of 50, an input impedance of 100Ω and an output impedance of 200Ω . The power gain of the of the amplifier is

A. 1000

B. 1250

C. 100

D. 500

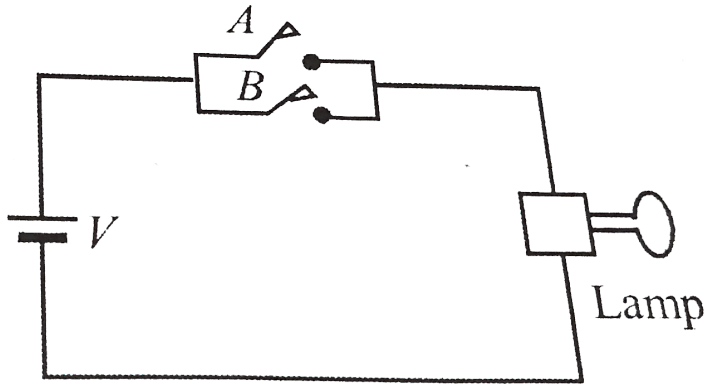
Answer:



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5. Which logic gate with inputs A and B performs the same operation as that

performed by the following circuit?



A. NAND gate

B. OR gate

C. NOR gate

D. AND gate

Answer:



6. In an unbiased p-n junction, holes diffuse from the p - region to n- region because

A. the potential difference across the p-n junction

B. the attraction of free electrons of n- region

C. the higher hole concentration in p- region than that in n-region

D. the higher concentration of electrons in the n-region than that in the p-region

Answer:



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7. A silicon diode has a threshold voltage of 0.7 V. If an input voltage given by $2\sin(\pi t)$ is supplied to a half wave rectifier circuit using this diode, the rectified output has a peak value of

A. 2 V

B. 1.4 V

C. 1.3 V

D. 0.7 V

Answer:



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8. The current gain for a transistor working as a common-base amplifier is 0.96. If the emitter current is 7.2mA , the base current will be

A. 0.29 mA

B. 0.35 mA

C. 0.39 mA

D. 0.43 mA

Answer:



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9. In an n-p-n transistor 10^{10} electrons enter the emitter in 10^{-6} s. If 2% of the electrons are

lost in the base, find the current transfer ratio and the current amplification factor.

A. 0.98

B. 0.97

C. 0.96

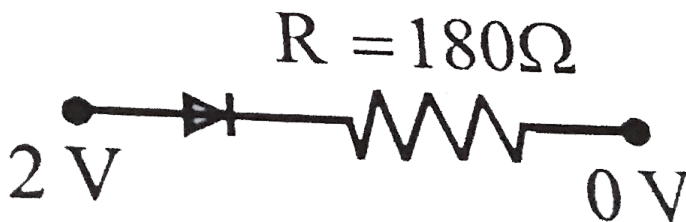
D. 0.94

Answer:



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10. Assuming that the silicon diode having resistance of 20Ω , the current through the diode is (knee voltage 0.7 V)



- A. 0 mA
- B. 10 mA
- C. 6.5 mA
- D. 13.5 mA

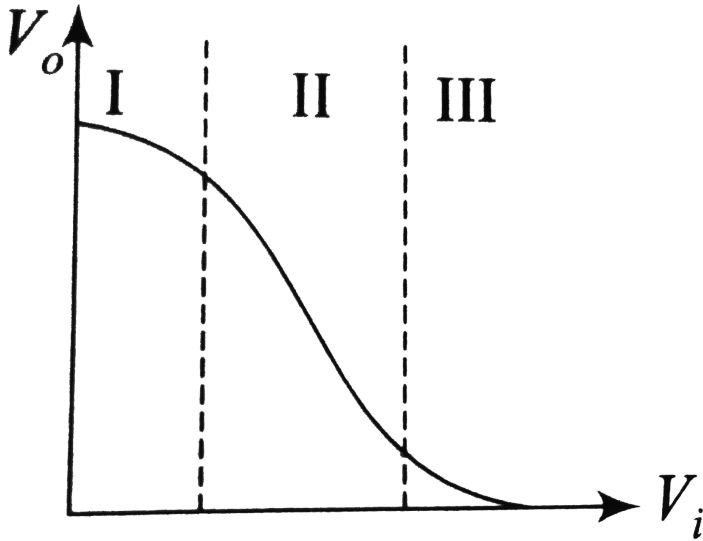
Answer:



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11. Transfer characteristics [output voltage (V_o) vs. input voltage (V_i)] for a base biased transistor in CE configuration is as shown in the figure. For using transfer as a which, it is

used



A. in region *III*

B. both in region (*I*) and (*III*)

C. in region *II*

D. in region (*I*)

Answer:



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12. A half-wave rectifier is being used to rectify an alternating voltage of frequency 50 Hz. The number of pulses of rectified current obtained in one second is

A. 50

B. 25

C. 100

D. 2000

Answer:



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13. A diode having potential difference $0.5V$ across its junction which does not depend on current, is connected in series with resistance of 20Ω across source. If $0.1A$ passes through resistance then what is the voltage of the source?

A. 1.5 V

B. 2.0 V

C. 2.5 V

D. 5 V

Answer:



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14. In common emitter amplifier, the current gain is 62. The collector resistance and input

resistance are $5k\Omega$ and 500Ω respectively. If the input voltage is $0.01V$, the output voltage is

A. $0.62 V$

B. $6.2 V$

C. $62 V$

D. $620 V$

Answer:



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15. On doping germanium with donor atoms of density 10^{17} cm^{-3} , find its conductivity in mho/cm, if $\mu = 3800 \text{ cm}^2 / \text{V} - \text{s}$.

A. 30.4

B. 60.8

C. 91.2

D. 121.6

Answer:



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16. The voltage gain of an amplifier with 9% negative feedback is 10. The voltage gain without feedback will be

A. 90

B. 10

C. 1.25

D. 100

Answer:

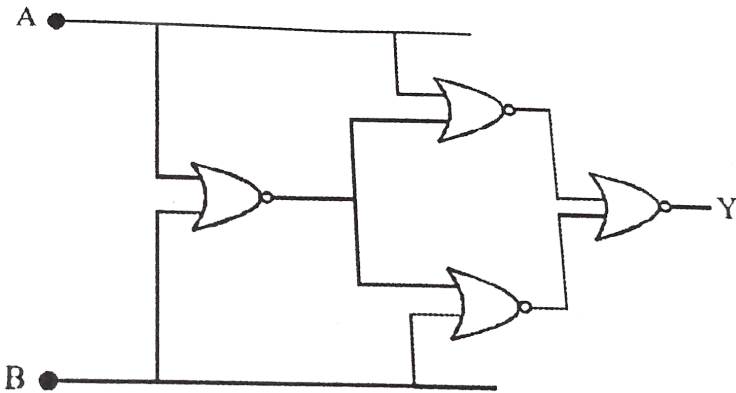


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17. A system of four gates is set up as shown.

The 'truth table' corresponding to this system

is :



	A	B	Y
	0	0	1
A.	0	1	0
	1	0	0
	1	1	1

	A	B	Y
	0	0	0
B.	0	1	0
	1	0	1
	1	1	0

	A	B	Y
	0	0	1
C.	0	1	0
	1	0	1
	1	1	0

	A	B	Y
	0	0	1
D.	0	1	1
	1	0	0
	1	1	0

Answer:



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18. The intrinsic conductivity of germanium at 27° is $2.13 \text{ mho } m^{-1}$ and mobilities of electrons and holes are 0.38 and $0.18 m^2 V^{-1} s^{-1}$ respectively. The density of charge carriers is

A. $2.37 \times 10^{19} m^{-3}$

B. $3.28 \times 10^{19} m^{-3}$

C. $7.83 \times 10^{19} m^{-3}$

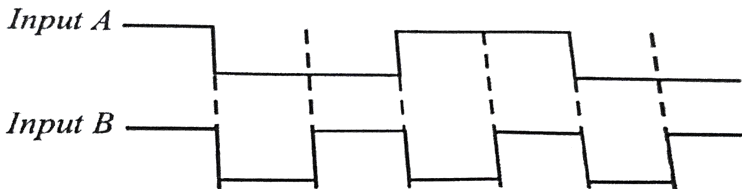
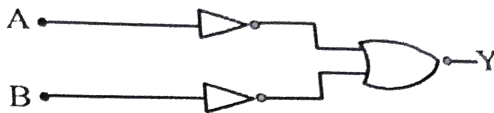
D. $8.47 \times 10^{19} m^{-3}$

Answer:



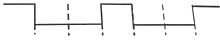
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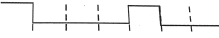
19. The logic circuit shown below has the input waveforms 'A' and 'B' as shown. Pick out the correct output waveform



A. ^(a)

B. ^(b)

C. (e) 

D. (d) 

Answer:



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20. Pure Si at $500K$ has equal number of electron (n_e) and hole (n_h) concentration of $1.5 \times 10^{16} m^{-3}$. Dopping by indium. Increases n_h to $4.5 \times 10^{22} m^{-3}$. The doped semiconductor is of

A. n-type with electron concentration

$$n_e = 5 \times 10^{22} m^{-3}$$

B. p-type with electron concentration

$$n_e = 2.5 \times 10^{10} m^{-3}$$

C. n-type with electron concentration

$$n_e = 2.5 \times 10^{23} m^{-3}$$

D. p-type having electron concentration

$$n_e = 5 \times 10^9 m^{-3}$$

Answer:



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21. Which of the following statements is incorrect?

A. The resistance of intrinsic semiconductors decrease with increase of temperature

B. Doping pure Si with trivalent impurities give p-type semiconductors

C. The majority carriers in n-type semiconductors are holes

D. A p-n junction can act as a semiconductor diode

Answer:



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22. The relation between number of free electrons (n) in a semiconductor and temperature (T) is given by

A. $n \propto T$

B. $n \propto T^2$

C. $n \propto \sqrt{T}$

D. $n \propto T^{3/2}$

Answer:



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23. If a PN junction diode of depletion layer width W and barrier height V_0 is forward biased, then

A. W increases V_0 decreases

B. W decreases, V_0 increases

C. both W and V_0 increase

D. both W and V_0 decrease

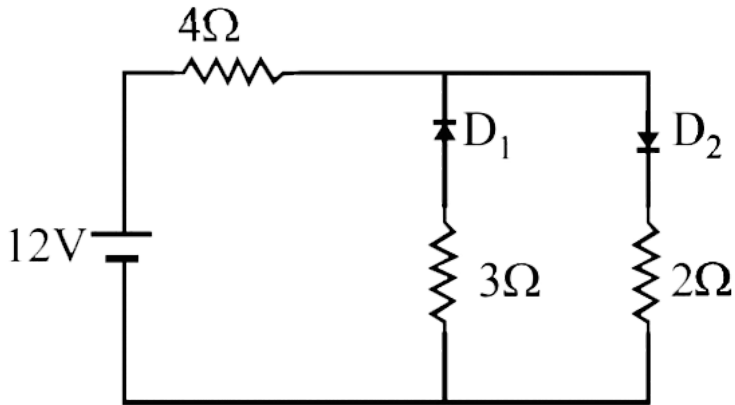
Answer:



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24. The circuit has two oppositely connected ideal diodes in parallel what is the current

flowing in the circuit ?



- A. 1.71 A
- B. 2.00 A
- C. 2.31 A
- D. 1.33 A

Answer:



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25. For a transistor amplifier in common emitter configuration for load impedance of $1k\Omega$ ($h_{fe} = 50$ and $h_{oe} = 25$) the current gain is

A. -24.8

B. -15.7

C. -5.2

D. -48.78

Answer:



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26. A PN - junction has a thickness of the order of
of

A. 1 cm

B. 1 mm

C. 10^{-6} m

D. 10^{-12} cm

Answer:



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27. A working transistor with its three legs marked P , Q and R is tested using a multimeter. No conduction is found between P , Q by connecting the common (negative) terminal of the multimeter to R and the other (positive) terminal to Q some resistance is seen on the multimeter. Which of the following is true for the transistor ?

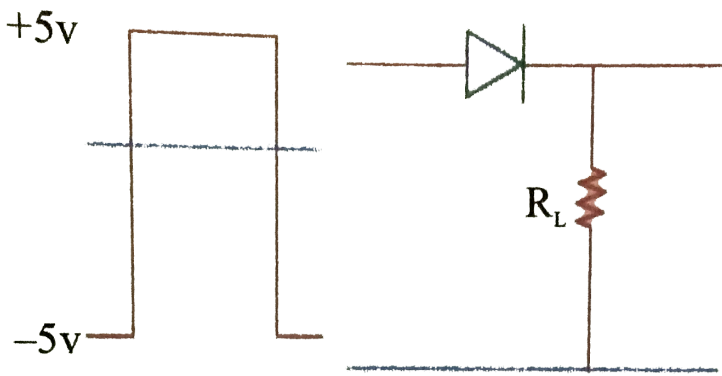
- A. It is an npn transistor with R as base
- B. It is a pnp transistor with R as base
- C. It is a pnp transistor with R as emitter
- D. It is an npn transistor with R as collector

Answer:

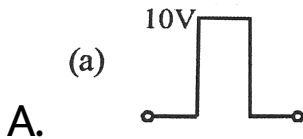
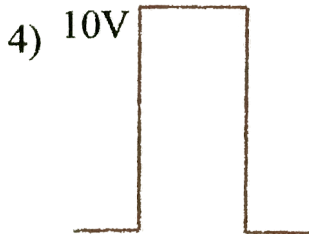
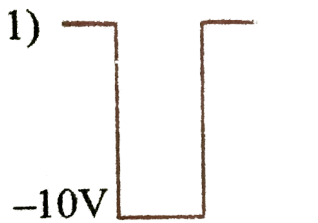


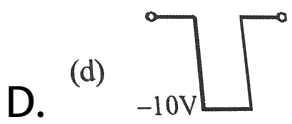
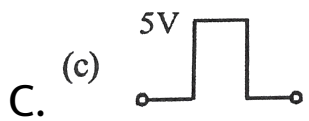
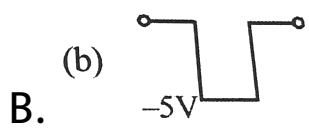
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28. If a $p - n$ junction diode, a square input signal of $10V$ is applied as shown.



Then the out put signal across R_L will be





Answer:



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29. When *N*-type of semiconductor is heated

A. number of electrons increases while that of holes decreases

B. number of holes increases while that of electrons decreases

C. number of electrons and holes remain same

D. number of electrons and holes increases equally

Answer:



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30. The ratio of electron and hole currents in a semiconductor is $7/4$ and the ratio of drift velocities of electrons and holes is $5/4$, then the ratio of concentrations of electrons and holes will be

A. $5/7$

B. $7/5$

C. $25/49$

D. $49/25$

Answer:



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31. C and Si both have same lattice structure, having 4 bonding electrons in each. However, C is insulator whereas Si is intrinsic semiconductor. This is because

A. In case of C the valence band is not completely filled at absolute zero temperature.

B. In case of C the conduction band is partly filled even at absolute zero temperature

C. The four bonding electrons in the case of C lie in the second orbit, whereas in the case of Si they lie in the third.

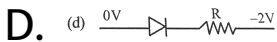
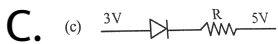
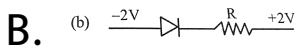
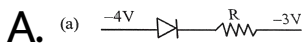
D. The four bonding electrons in the case of C lie in the third orbit, whereas for Si they lie in the fourth orbit.

Answer:



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32. Which one of the following represents forward bias diode?



Answer:



33. An oscillator is nothing but an amplifier with

- A. positive feedback
- B. negative feedback
- C. large gain
- D. no feedback

Answer:



34. The current gain in the common emitter mode of a transistor is 10. The input impedance is $20k\Omega$ and load of resistance is $100k\Omega$. The power gain is

A. 300

B. 500

C. 200

D. 100

Answer:



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35. The input signal given to a CE amplifier having a voltage gain of 150 is $V_i = 2 \cos\left(15t + \frac{\pi}{3}\right)$. The corresponding output signal will be

A. $75 \cos\left(15t + \frac{2\pi}{3}\right)$

B. $2 \cos\left(15t + \frac{5\pi}{6}\right)$

C. $300 \cos\left(15t + \frac{4\pi}{3}\right)$

D. $300 \cos\left(15t + \frac{\pi}{3}\right)$

Answer:



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36. In the use of transistor as an amplifier

- A. the emitter base junction is forward biased and the base collector junction is reverse biased
- B. no bias voltage is required
- C. both junctions are forward biased

D. both junctions are reverse biased.

Answer:



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37. A piece of copper and another of germanium are cooled from room temperature to $80K$. The resistance of

A. copper increases and germanium decreases

B. each of them decreases

C. each of them increases

D. copper decreases and germanium increases

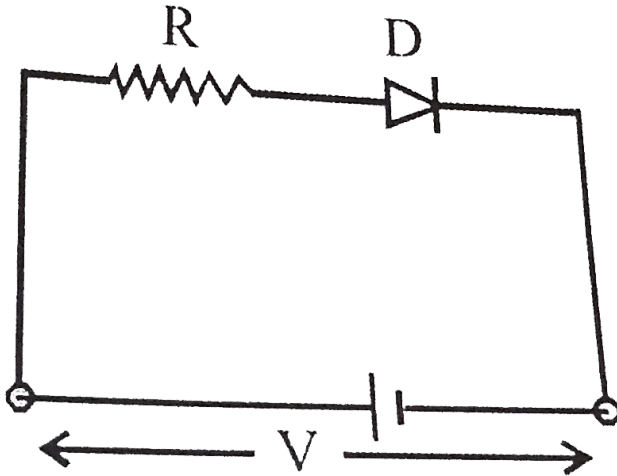
Answer:



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38. A d.c. battery of V volt is connected to a series combination of a resistor R and an ideal diode D as shown in the figure below. The

potential difference across R will be



- A. 2V when diode is forward biased
- B. Zero when diode is forward biased
- C. 5V when diode is reverse biased
- D. 6V when diode is forward biased

Answer:



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39. The current gain for a transistor working as a common-base amplifier is 0.96. If the emitter current is 7.2mA , the base current will be

A. 0.29 mA

B. 0.35 mA

C. 0.39 mA

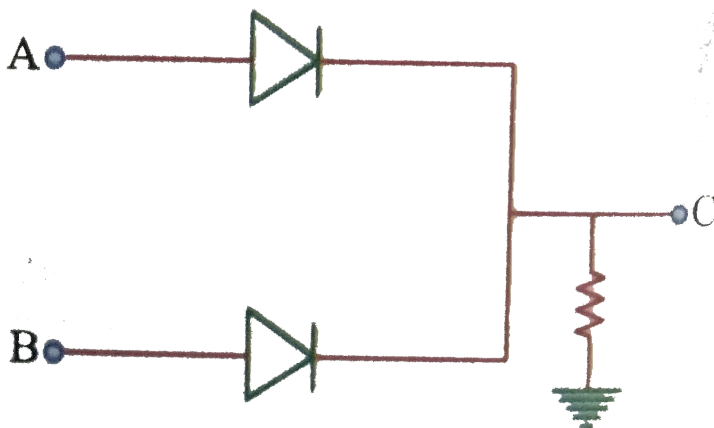
D. 0.43 mA

Answer:



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40. In the circuit below, A and B represents two inputs and C represents the output, the circuit represents.



A. NOR gate

B. AND gate

C. NAND gate

D. OR gate

Answer:



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41. The i - V characteristic of a p - n junction diode is shown in figure. Find the approximate dynamic resistance of the p - n junction when

(a) a forward bias of 1 volt is applied ,(b) a forward bias of 2 volt is applied is applied .



A. 1Ω

B. 0.25Ω

C. 0.5Ω

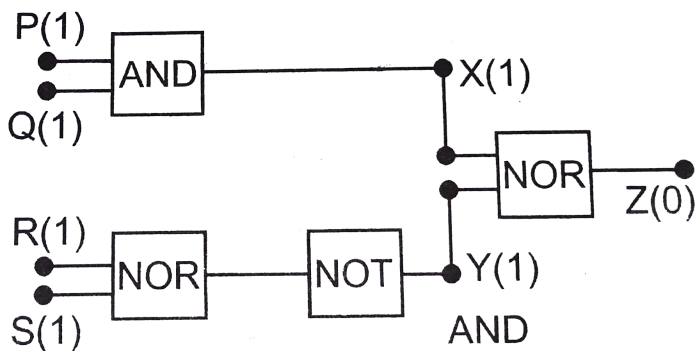
D. 5Ω

Answer:



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42. The circuit diagram (see fig.) shows a 'logic combination' with the states outputs X, Y and Z given for input P, Q, R and S all at state 1 (i.e., high). When inputs P and R change to state 0 i.e., low) with inputs Q and S still at 1, the condition of output X, Y and Z changes to



A. 1, 0, 0

B. 1, 1, 1

C. 0, 1, 0

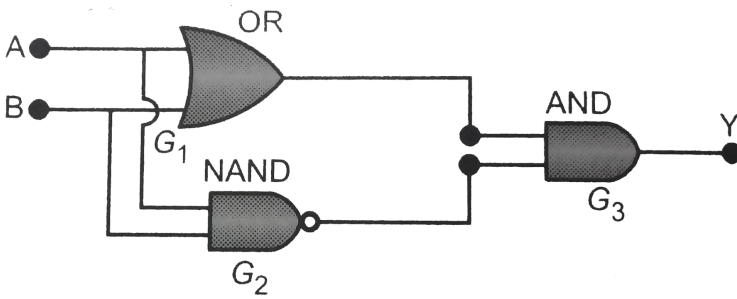
D. 0, 0, 1

Answer:



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43. The following configuration of gate is equivalent to



A. NAND gate

B. XOR gate

C. OR gate

D. NOR gate

Answer:



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44. A $p - n$ photodiode is made of a material with a band gap of $2.0eV$. The minimum frequency of the radiation that can be absorbed by the material is nearly

A. $10 \times 10^{14} Hz$

B. $5 \times 10^{14} Hz$

C. $1 \times 10^{14} Hz$

D. $20 \times 10^{14} Hz$

Answer:



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45. The average value of output direct current in a full wave rectifier is

A. I_0 / π

B. $I_0 / 2$

C. $\pi I_0 / 2$

D. $2I_0 / \pi$

Answer:



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