

TEST

JEE Mains PYQs (Semiconductor devices)

QUESTIONS

SECTIONS

1. Section A - 25 Questions

Section 1 : Section A - 25 Questions

SECTION INSTRUCTIONS

This section contains 25 MCQs. +4 for every correct answer, -1 for every incorrect answer.

1 Statement 1: By doping silicon semiconductor with pentavalent material the electrons density increases

Statement 2: The n type semiconductor has net negative charge

In the light of above statements, choose the most appropriate answer from the options given below:

- Statement 1 is true but statement 2 is false
- Statement 1 is false but statement 2 is true
- Both statement 1 and statement 2 are true
- Both statement 1 and statement 2 are false

Correct: +4 · Incorrect: -1

2 Consider a situation in which reverse biased current of a particular P-N junction increases when it is exposed to a light of wavelength $\leq 621\text{nm}$. During this process, enhancement in carrier concentration takes place due to generation of hole electron pairs. The value of band gap is nearly

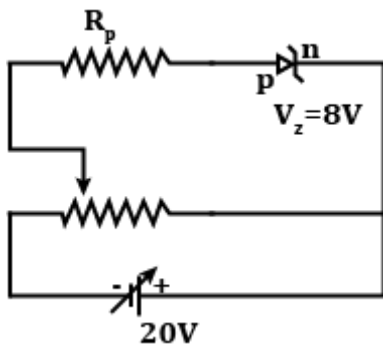
- 2eV
- 4eV
- 1eV
- 0.5eV

Correct: +4 · Incorrect: -1

3 A zener diode having zener voltage 8V and power dissipation rating of 0.5W is connected across a potential divider arranged with

maximum potential drop across zener diode is s shown in the diagram. The value of protective resistance T_p is $___\Omega$.

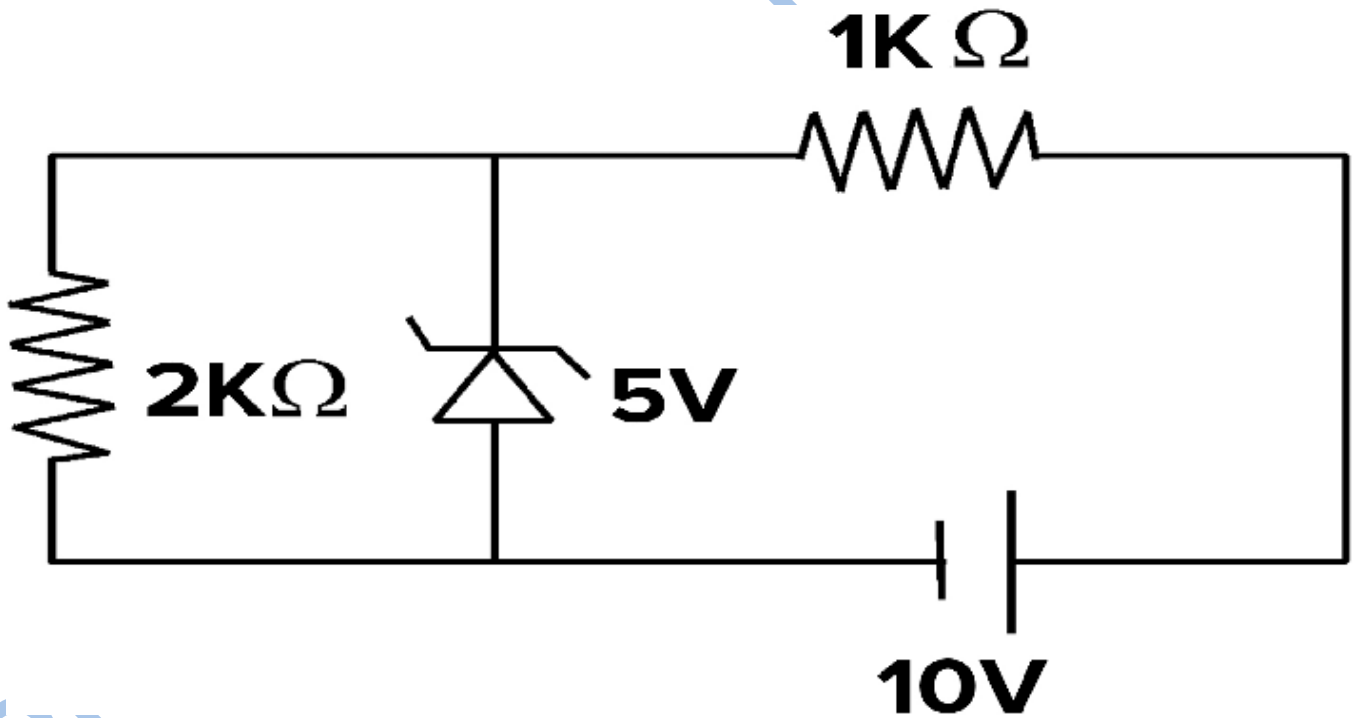
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- 188
- 190
- 192
- 195

Correct: +4 · Incorrect: -1

4 In connection with the circuit drawn below, the value of current flowing through $2k\Omega$ resistor is $_ \times 10^{-4}A$.



- 15
- 20
- 25
- 18

5 Zener breakdown occurs in a p-n junction having p and n both

- lightly doped and have wide depletion layer
- heavily doped and have narrow depletion layer
- lightly doped and have narrow depletion layer
- heavily doped and have wide depletion layer

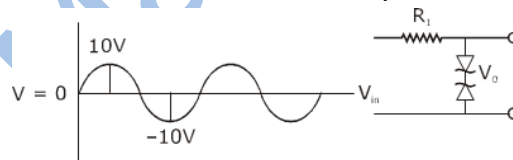
Correct: +4 · Incorrect: -1

6 LED is constructed from Ga-As-P semiconducting material. The energy gap of this LED is 1.9eV. Calculate the wavelength of light emitted and its colour. [$h = 6.63 \times 10^{-34}$ Js and $c = 3 \times 10^8$ m/s]

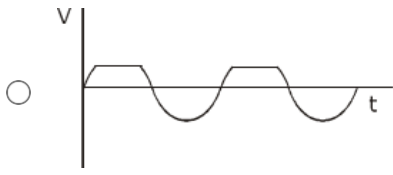
- 654nm and red colour
- 1046nm and blue colour
- 1046nm and red colour
- 654nm and orange colour

Correct: +4 · Incorrect: -1

7 Take the breakdown voltage of the zener diode used in the given circuit as 6V. For the input voltage shown in figure below, the time variation of the output voltage is (Graphs drawn are schematic and not to scale)

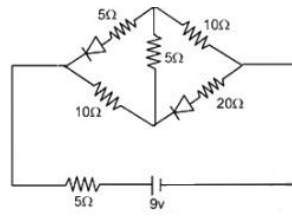


-
-
-



Correct: +4 · Incorrect: -1

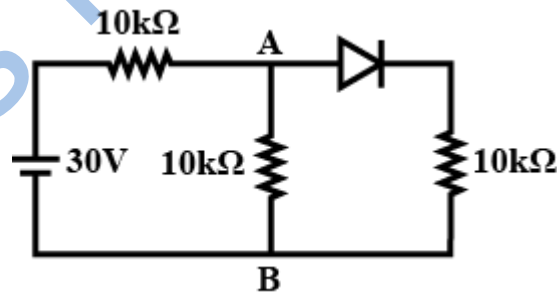
8 The current i in the network is



- 0.2A
- 0.6A
- 0.3A
- 0A

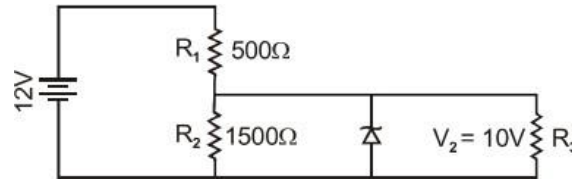
Correct: +4 · Incorrect: -1

9 In the figure potential difference between A and B is



- 10V
- 5V
- 15V
- zero

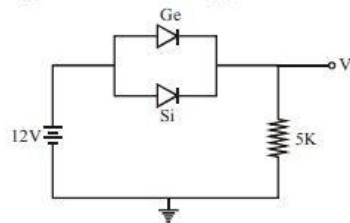
10 In the given circuit the current through Zener diode is close to



- 0.0mA
- 6.7mA
- 4.0mA
- 6.0mA

Correct: +4 · Incorrect: -1

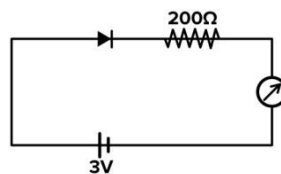
11 Ge and Si diodes start conducting at 0.3V and 0.7V respectively. In the following figure if Ge diode connection are reversed, the value of V_0 changes by (assumed that the Ge diode has large breakdown voltage)



- 0.8V
- 0.6V
- 0.2V
- 0.4V

Correct: +4 · Incorrect: -1

12 The reading of the ammeter for a silicon diode in the given circuit is

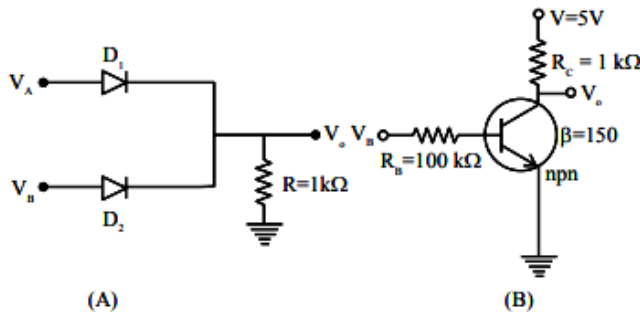


- 0

- 15mA
- 11.5mA
- 13.5mA

Correct: +4 · Incorrect: -1

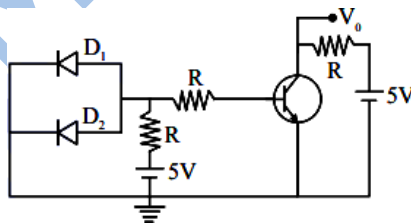
13 If V_A and V_B are the input voltages (either 5V or 0V) and V_B is the output voltage then two gates represented in the following circuit (A) and (B) are



- AND and OR gate
- OR and NOT gate
- NAND and NOR gate
- AND and NOT gate

Correct: +4 · Incorrect: -1

14 A circuit is arranged as shown in figure. The output voltage V_0 is equal to __V.



- 2
- 3
- 4
- 5

Correct: +4 · Incorrect: -1

15 For a transistor in CE mode to be used as an amplifier, it must be operated in

- both cut off and saturation
- saturation region only
- cut off region only
- the active region only

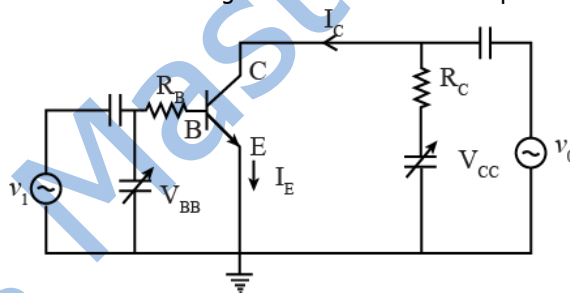
Correct: +4 · Incorrect: -1

16 An npn transistor operates as a common emitter amplifier, with a power gain of 60dB. The input circuit resistance is 100Ω and the output load resistance is $10k\Omega$. The common emitter current gain β is

- 10^2
- 60
- 60×10^2
- 10^4

Correct: +4 · Incorrect: -1

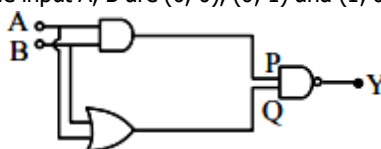
17 IN the figure given that V_{BB} supply can vary from 0 to 5.0 V, $V_{CC} = 5V$, $\beta_{dc} = 200$, $R_B = 100k\Omega$, $R_C = 1k\Omega$ and $V_{BE} = 1.0V$. the minimum base current and the input voltage at which the transistor will go to saturation will be respectively



- 25 μ A and 3.5V
- 20 μ A and 3.5V
- 25 μ A and 2.8V
- 20 μ A and 2.8V

Correct: +4 · Incorrect: -1

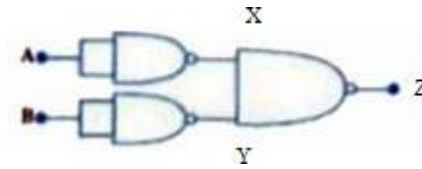
18 In the following logic circuit the sequence of the input A, B are (0, 0), (0, 1) and (1, 0), (1, 1). The output Y for this sequence will be



- 1,0,1,0
- 0,1,0,1
- 1,1,1,0
- 0,0,1,1

Correct: +4 · Incorrect: -1

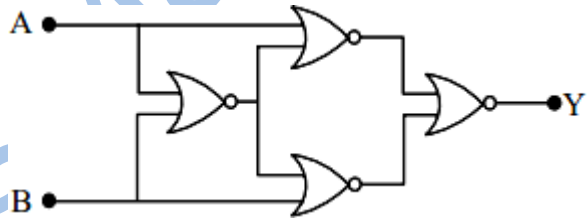
19 Identify the logic operation carried out by the given circuit:



- OR
- AND
- NOR
- NAND

Correct: +4 · Incorrect: -1

20 Four NOR gates are connected as shown in figure. The truth table for the given figure is



| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

-

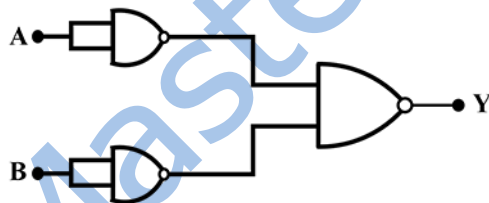
| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

Correct: +4 · Incorrect: -1

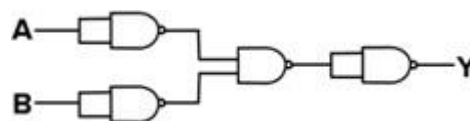
21 Identify the logic operation carried out



- OR
- AND
- NOR
- NAND

Correct: +4 · Incorrect: -1

22 The following logic gate is equivalent to

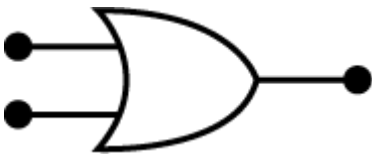
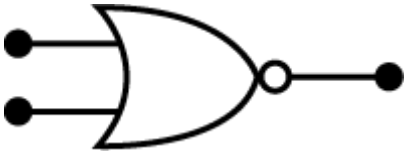
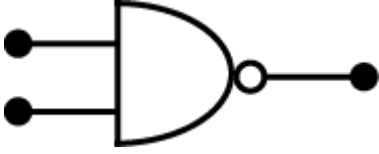



- OR gate

- NAND gate
- NOR gate
- AND gate

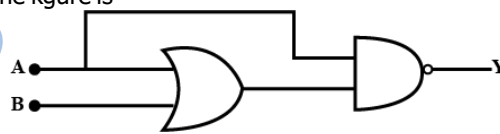
Correct: +4 · Incorrect: -1

23 Which of the following gives a reversible operation?

- 
- 
- 
- 

Correct: +4 · Incorrect: -1

24 The truth table for the circuit given in the figure is



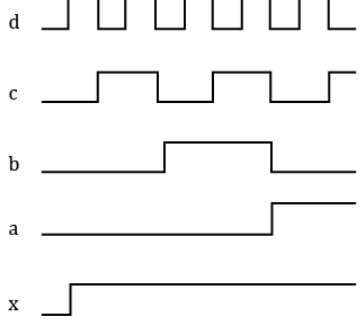
- $$\begin{bmatrix} A & B & C \\ 0 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$
- $$\begin{bmatrix} A & B & C \\ 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 1 & 0 \end{bmatrix}$$

$$\begin{bmatrix} A & B & C \\ 0 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 1 & 0 \end{bmatrix}$$

$$\begin{bmatrix} A & B & C \\ 0 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

Correct: +4 · Incorrect: -1

25 If a, b, c, d are inputs to a gate and x is its output, then as per the following time graph, the gate is



- OR
- NAND
- NOT
- AND

Correct: +4 · Incorrect: -1

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ANSWERS

SECTIONS

1. Section A - 25 Questions

Section 1 : Section A - 25 Questions

1 Statement 1 is true but statement 2 is false

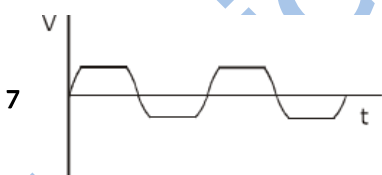
2 2eV

3 192

4 25

5 heavily doped and have narrow depletion layer

6 654nm and red colour



8 0.3A

9 10V

10 0.0mA

11 0.4V

12 11.5mA

13 OR and NOT gate

14 5

15 the active region only

16 10^2

17 $25 \mu\text{A}$ and 3.5V

18 1, 1, 1, 0

19 NOR

| | A | B | Y |
|----|---|---|---|
| | 0 | 0 | 1 |
| 20 | 0 | 1 | 0 |
| | 1 | 0 | 0 |
| | 1 | 1 | 1 |

21 NOR

22 NOR gate



24
$$\begin{bmatrix} A & B & C \\ 0 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 1 & 0 \end{bmatrix}$$

25 OR

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