

إلكترونيات 1 امتحان نصفي نموذج 1

عدد الاسئلة: 14 سؤال
المدة: ساعة وربع

Question 1

Not yet answered

Marked out of 10

🚩 Flag question

Assume the input signal to a rectifier circuit has a peak value of $V_M = 12\text{ V}$ and is at a frequency of 60 Hz. Assume the output load resistance is $R = 2\text{ k}\Omega$ and the ripple voltage is to be limited to $V_r = 0.4\text{ V}$. Determine the capacitance required to yield this specification for half-wave rectifier

Select one:

- ☐ A. $C = 250\mu\text{F}$
- ☐ B. $C = 200\mu\text{F}$
- ☐ C. $C = 125\mu\text{F}$
- ☐ D. $C = 50\mu\text{F}$

Question 2

Not yet answered

Marked out of 2

🚩 Flag question

The power gain in a BJT amplifier is defined as:

- ☐ The ratio of output current to input current.
- ☐ The ratio of output power to input power.
- ☐ The product of voltage gain and current gain.
- ☐ The ratio of input voltage to output voltage.

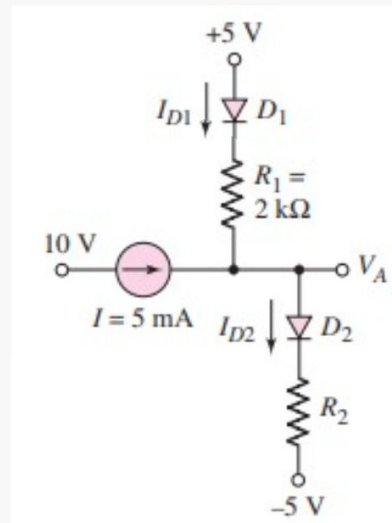
Question 3

Not yet answered

Marked out of 10

Flag question

Consider the circuit in Figure, assume both diodes are silicon diodes. For $V_A = 0$, what are the values of Find R_2 and I_{D2} ?



Select one:

- ☐ A. $I_{D2} = 2.75$ mA and $R_2 = 10$ kΩ
- ☐ B. $I_{D2} = 0$ mA and $R_2 = 2.60$ kΩ
- ☐ C. $I_{D2} = 2.15$ mA and $R_2 = 0.60$ kΩ
- ☐ D. $I_{D2} = 7.15$ mA and $R_2 = 0.60$ kΩ

Question 4

Not yet answered

Marked out of 2

Flag question

Which of the following conditions is necessary for the operation of a BJT?

- ☐ Collector must be grounded.
- ☐ Collector must always be at a higher potential than the emitter.
- ☐ Emitter must inject carriers into the base.
- ☐ Base-emitter junction must be reverse biased.

Question 5

Not yet answered

Marked out of 2

🚩 Flag question

The process of doping a semiconductor is used to:

- ☐ Increase the resistivity
- ☐ Control the concentration of charge carriers
- ☐ Create an energy band gap
- ☐ Decrease the conductivity

In a forward-biased p-n junction, the majority carriers are:

- ☐ Electrons in the n-type region
- ☐ Holes in the p-type region
- ☐ Electrons in the p-type region
- ☐ Holes in the n-type region

Question 9

Not yet answered

Marked out of 2

🚩 Flag question

The equilibrium carrier concentration in an intrinsic semiconductor is:

- ☐ The product of the electron concentration and hole concentration
- ☐ Dependent only on the temperature
- ☐ Equal to the concentration of electrons in the conduction band
- ☐ Equal to the concentration of holes in the valence band

Question 10

Not yet answered

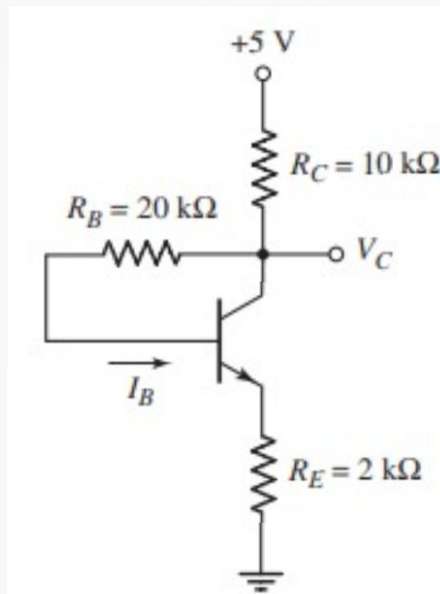
Marked out of 2

🚩 Flag question

In a common-emitter amplifier, what is the relationship between voltage gain and collector resistance?

- ☐ Gain decreases with increasing collector resistance
- ☐ Gain is directly proportional to collector resistance
- ☐ Gain is independent of collector resistance
- ☐ Gain is inversely proportional to collector resistance

For the transistor in Figure , $\beta = 75$, $V_{BE}=0.7$ V. Find the values of I_B and V_C



Select one:

- ☐ A. $I_B = 20 \mu\text{A}$ and $V_C = 3.25 \text{ V}$
- ☐ B. $I_B = 4.61 \mu\text{A}$ and $V_C = 1.49 \text{ V}$
- ☐ C. $I_B = 22.5 \mu\text{A}$ and $V_C = 4.92 \text{ V}$
- ☐ D. $I_B = 6.24 \mu\text{A}$ and $V_C = 1.49 \text{ V}$

Question 7

Not yet answered

Marked out of 2

Flag question

What happens to the output impedance of a common-emitter amplifier when a bypass capacitor is added across the emitter resistor?

- ☐ The output impedance increases at high frequencies
- ☐ The output impedance remains the same
- ☐ The output impedance decreases at low frequencies
- ☐ The output impedance decreases at high frequencies

Question 11

Not yet answered

Marked out of 2

🚩 Flag question

In an ideal diode, the reverse current is due to:

- ☐ Minority carriers
- ☐ Majority carriers
- ☐ Thermal excitation
- ☐ Both minority and majority carriers

Question 12

Not yet answered

Marked out of 2

🚩 Flag question

In a diode, when the forward bias voltage exceeds a certain value, the current increases:

- ☐ Inversely
- ☐ Exponentially
- ☐ Linearly
- ☐ Logarithmically

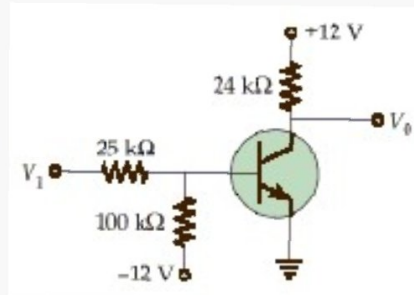
Question 13

Not yet answered

Marked out of 10

Flag question

Consider the circuit shown below:



If the value of the output $V_O = 6V$ and $\beta = 100$ and $V_{BE(ON)} = 0.7V$, then the value of the input voltage V_I is approximately equal to

Select one:

- ☐ A. 0.7V
- ☐ B. 101.16 V
- ☐ C. 3.94V
- ☐ D. 13.12 V

Question 14

Not yet answered

Marked out of 2

Flag question

Which of the following describes the behavior of a transistor in the cut-off region?

- ☐ Only the base-emitter junction is reverse biased.
- ☐ The collector current is approximately zero.
- ☐ The transistor conducts maximum current.
- ☐ Both junctions are forward biased.

If the value of the output $V_O=6V$ and $\beta =100$ and $V_{BE(ON)}=0.7V$, then the value of the input voltage V_I is approximately equal to

Select one:

- ☐ A. 0.7V
- ☐ B. 101.16 V
- ☐ C. 3.94V
- ☐ D. 13.12 V

إلكترونيات 1 امتحان نصفى نموذج 2

عدد الاسئلة: 14 سؤال
المدة: ساعة وربع

Question 1

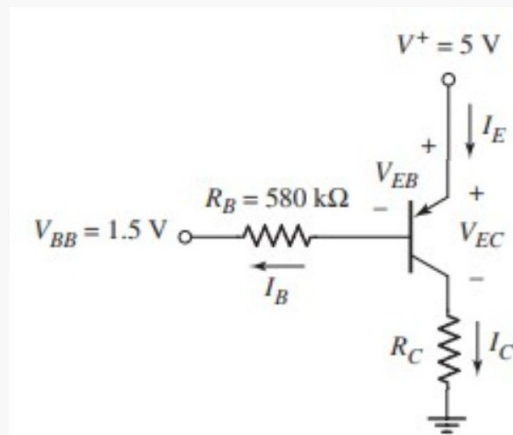
Not yet answered

Marked out of 10

Flag question

For the shown circuit , calculate I_C current and R_C voltage such that $V_{EC} = 2.5$ V.

($V_{EB(ON)} = 0.6$ V, and $\beta = 100$)



Select one:

- ☐ A. $I_C = 1$ mA and $R_C = 200 \text{ }\Omega$
- ☐ B. $I_C = 0.5$ mA and $R_C = 5 \text{ k}\Omega$
- ☐ C. $I_C = 0.505$ mA and $R_C = 4.7 \text{ }\Omega$
- ☐ D. $I_C = 2$ mA and $R_C = 2.5 \text{ k}\Omega$

Question 2

Not yet answered

Marked out of 2

Flag question

The depletion region in a p-n junction is formed by:

- ☐ Electrons moving from the n-region to the p-region
- ☐ The movement of impurities from the p-type region to the n-type region
- ☐ The recombination of electrons and holes near the junction
- ☐ Holes moving from the p-region to the n-region

Not yet answered

Marked out of 2

🚩 Flag question

In which region does a bipolar transistor operate as a current amplifier?

- ☐ Active region.
- ☐ Saturation region.
- ☐ Breakdown region.
- ☐ Cut-off region.

Question 4

Not yet answered

Marked out of 2

🚩 Flag question

The reverse breakdown in a pn junction occurs due to which phenomenon?

- ☐ Tunneling effect
- ☐ Avalanche breakdown
- ☐ Punch-through effect
- ☐ Zener breakdown

Question 5

Not yet answered

Marked out of 2

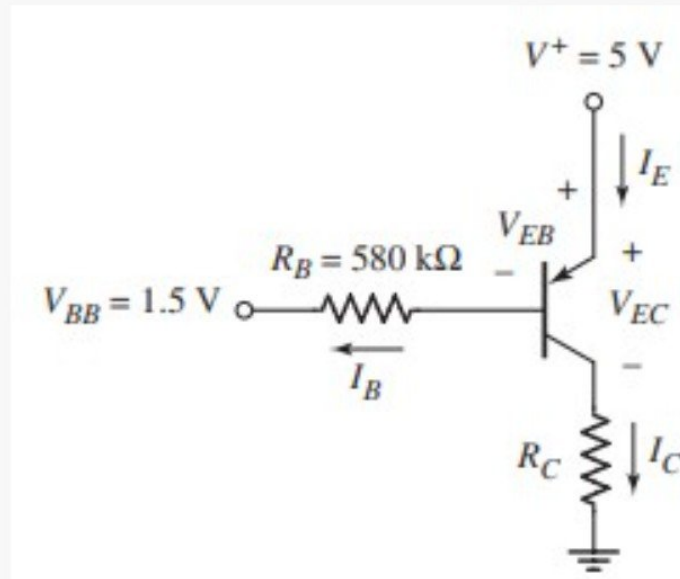
🚩 Flag question

In a BJT, increasing the collector-base voltage while keeping constant results in:

- ☐ No change in collector current.
- ☐ Decreased collector current.
- ☐ Increased base current.
- ☐ Increased collector current.

For the shown circuit , calculate I_C current and R_C voltage such that $V_{EC} = 2.5 \text{ V}$.

($V_{EB(\text{on})} = 0.6 \text{ V}$, and $\beta = 100$)



Select one:

- ☐ A. $I_C = 1 \text{ mA}$ and $R_C = 200 \text{ }\Omega$
- ☐ B. $I_C = 0.5 \text{ mA}$ and $R_C = 5 \text{ k}\Omega$
- ☐ C. $I_C = 0.505 \text{ mA}$ and $R_C = 4.7 \text{ }\Omega$
- ☐ D. $I_C = 2 \text{ mA}$ and $R_C = 2.5 \text{ k}\Omega$

Question 6

Not yet answered

Marked out of 2

🚩 Flag question

What defines the quiescent point (Q-point) of a BJT?

- ☐ The point of saturation.
- ☐ The point of maximum current.
- ☐ The point at which the transistor is turned off.
- ☐ The DC operating point in the active region.

Question 7

Not yet answered

Marked out of 2

🚩 Flag question

What is the main purpose of the Early effect in the context of bipolar junction transistors (BJTs)?

- ☐ It increases the transistor's current gain β
- ☐ It decreases the voltage gain
- ☐ It increases the transistor's breakdown voltage
- ☐ It describes the effect of base-width modulation on the output characteristics

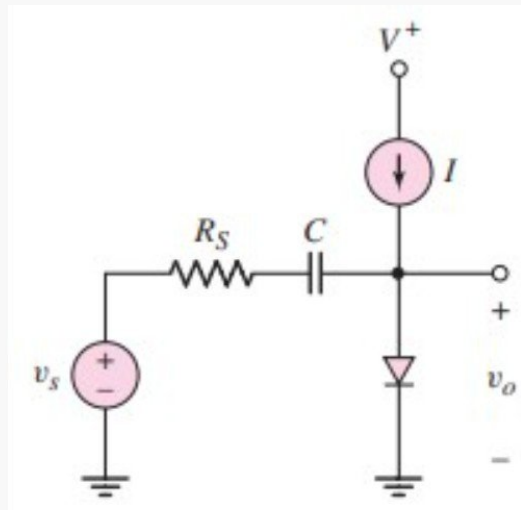
Question 8

Not yet answered

Marked out of 10

Flag question

For the circuit shown in Figure, if $R_S = 260\ \Omega$, find v_O/v_S , for $I = 0.1\text{ mA}$.



Select one:

- ☐ A. 0.5
- ☐ B. 0.0505
- ☐ C. 0.909
- ☐ D. 0.0909

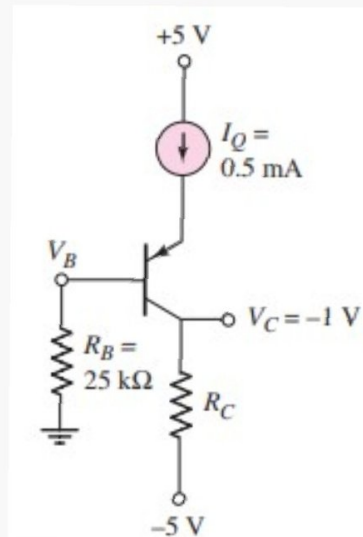
Question 9

Not yet answered

Marked out of 10

Flag question

For the transistor in Figure , $\beta = 75$ and $V_{EB} = 0.7$ V. Find the value of V_B and R_C



Select one:

- ☐ A. $V_B = 1.46$ V and $R_C = 8.11$ kΩ
- ☐ B. $V_B = 0.164$ V and $R_C = 8.11$ kΩ
- ☐ C. $V_B = 5$ and $R_C = 5$ kΩ
- ☐ D. $V_B = 10$ V and $R_C = 2.5$ kΩ

Question 10

Not yet answered

Marked out of 2

Flag question

Which amplifier topology is most commonly used in RF (radio frequency) circuits due to its low input impedance?

- ☐ Common-base
- ☐ Common-emitter
- ☐ Emitter follower
- ☐ Cascode

Not yet answered

Marked out of 2

🚩 Flag question

The p-n junction acts as a diode because:

- ☐ It prevents current flow entirely
- ☐ It allows current flow in both directions equally
- ☐ It allows current to flow only in the forward direction
- ☐ It allows current to flow only in the reverse direction

Question **12**

Not yet answered

Marked out of 2

🚩 Flag question

What causes Zener breakdown in a semiconductor diode?

- ☐ High forward current
- ☐ Low resistivity
- ☐ High temperature
- ☐ High electric field near the junction

Question **13**

Not yet answered

Marked out of 2

🚩 Flag question

The mobility of charge carriers in a semiconductor depends on:

- ☐ Band gap of the material
- ☐ Impurity concentration only
- ☐ Temperature only
- ☐ Both temperature and impurity concentration

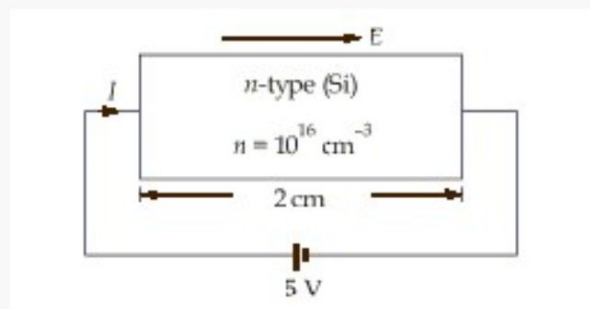
Question 14

Not yet answered

Marked out of 10

Flag question

Consider a silicon semiconductor bar shown below:



The electron current density in the above semiconductor is

(Assume mobility of electron is $2500 \text{ cm}^2/\text{V}\cdot\text{sec}$)

Select one:

- ☐ A. 25 A/cm^2
- ☐ B. 5 A/cm^2
- ☐ C. 20 A/cm^2
- ☐ D. 10 A/cm^2

إلكترونيات 1
امتحان نهائي
نموذج 1

عدد الاسئلة: 14 سؤال
المدة: ساعتين

Question 1

Not yet
answered

Marked out of 1

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question

The donor impurity in an n-type semiconductor contributes:

- ☐ Holes to the conduction band
- ☐ Electrons to the conduction band
- ☐ Holes to the valence band
- ☐ Electrons to the valence band

Question 2

Not yet
answered

Marked out of 7

Flag
question

An NMOS transistor has $L = 0.54 \mu\text{m}$ and $W = 10.8 \mu\text{m}$, $\mu_n C_{ox} = 400 \mu\text{A/V}^2$, $V_{tn} = 0.5 \text{ V}$, and $V_A = 2.7 \text{ V}$. If the device is operated in saturation with an overdrive voltage of 0.2 V , find the values of g_m and r_o

Select one:

- ☐ A. $g_m = 1.6 \text{ mA/V}$, $r_o = 16.9 \text{ k}\Omega$
- ☐ B. $g_m = 4.8 \text{ mA/V}$, $r_o = 32.9 \text{ k}\Omega$
- ☐ C. $g_m = 5.7 \text{ mA/V}$, $r_o = 12.5 \text{ k}\Omega$
- ☐ D. $g_m = 3.2 \text{ mA/V}$, $r_o = 9.16 \text{ k}\Omega$

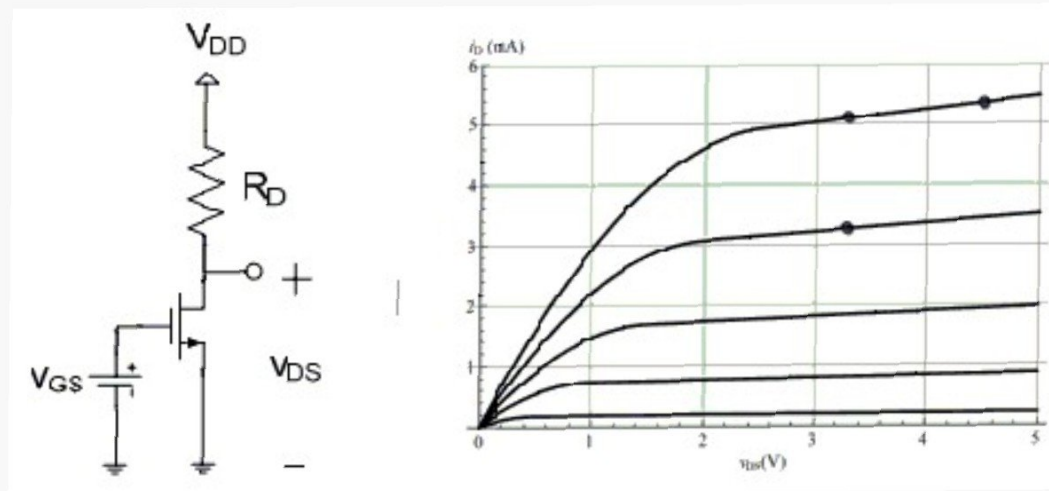
Question 3

Not yet answered

Marked out of 7

Flag question

To analyze the circuit shown below, we use the MOSFET characteristics shown. The $i_D - v_{DS}$ curves correspond to the following values of V_{GS} : 1.2, 1.7, 2.2, 2.7, and 3.2 V. The three points shown on the plot have the following coordinates (3.3 V, 3.26 mA), (3.3 V, 5.10 mA), and (4.5 V, 5.36 mA). Assume that $V_{DD} = 5$ V and $R_D = 1$ k Ω . **What is the region of operation of the MOSFET if V_{GS} is raised to 3.2 V?**



Select one:

- ☐ A. Linear
- ☐ B. Saturation
- ☐ C. Cut-off
- ☐ D. Not enough data to decide

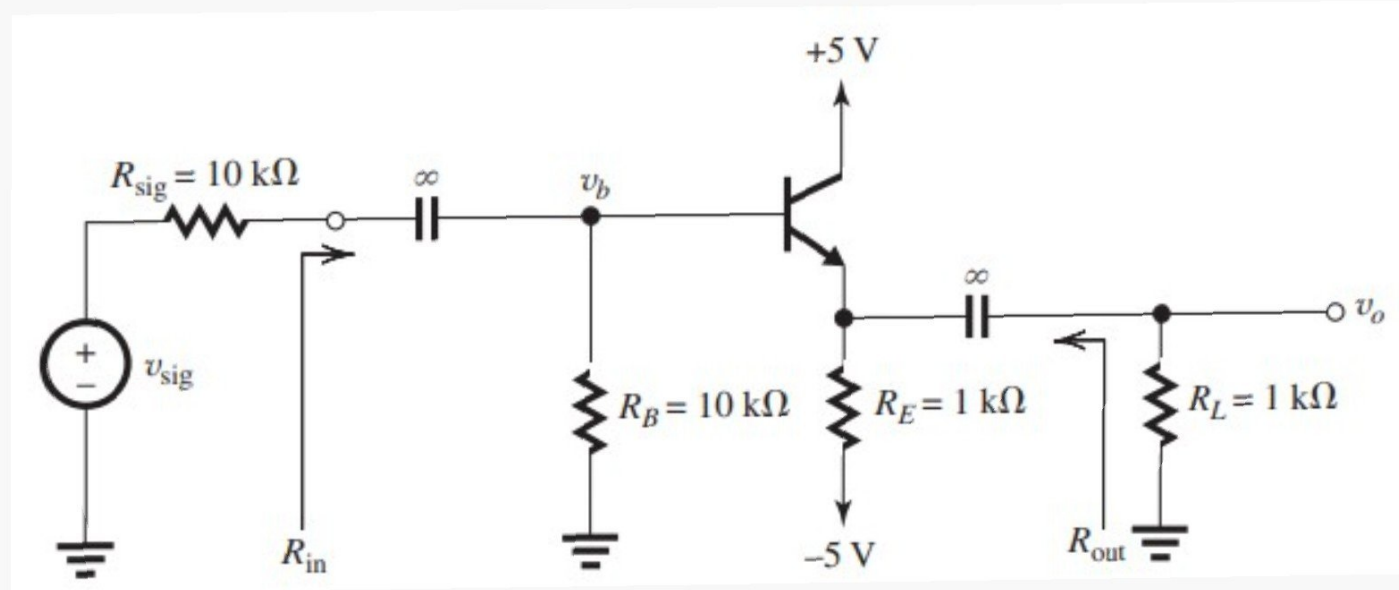
Question 4

Not yet answered

Marked out of 5

Flag question

The transistor in the emitter follower has $\beta = 100$. Assume $V_{BE} = 0.7 \text{ V}$, $V_T = 25 \text{ mV}$ and neglect the Early effect. Find the voltage gain v_o/v_b .



Select one:

- ☐ A. $v_o/v_b = 0.987 \text{ V/V}$
- ☐ B. $v_o/v_b = 0.892 \text{ V/V}$
- ☐ C. $v_o/v_b = 0.675 \text{ V/V}$
- ☐ D. $v_o/v_b = 0.768 \text{ V/V}$

Question 5

Not yet
answered

Marked out of
6

Flag
question

A doped semiconductor has an acceptor concentration of 10^{18} cm^{-3} . The intrinsic density is $1.5 \times 10^{10} \text{ cm}^{-3}$. The mobility of holes is $500 \text{ cm}^2/\text{Vs}$ and that of free electrons is $1300 \text{ cm}^2/\text{Vs}$. The elementary charge q is $1.6 \times 10^{-19} \text{ C}$.

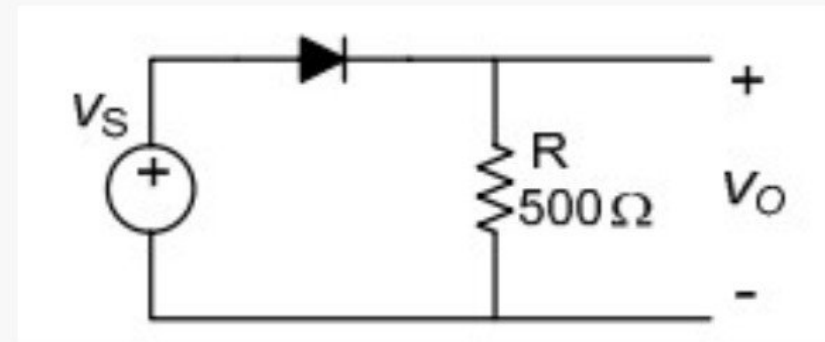
Calculate the conductivity of the semiconductor (in S/cm).

Select one:

- ☐ A. 246
- ☐ B. 80
- ☐ C. 50
- ☐ D. 12

In the circuit shown below, $V_{D,on}=0.8V$. The source is $V_S = 8 \sin(2\pi \times 100t) \text{ V}$.

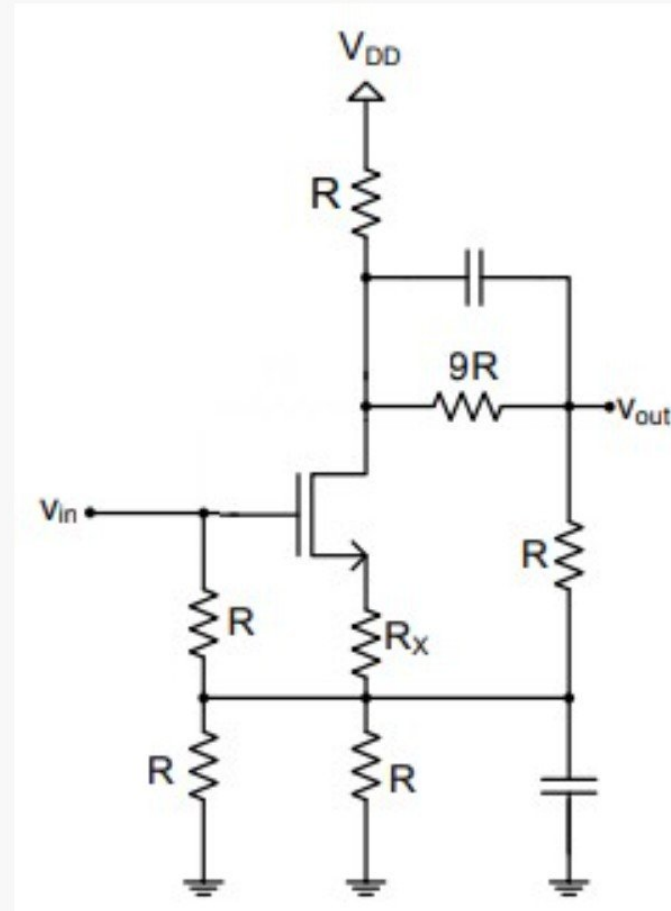
Find the PIV for the diode, in V.



Select one:

- ☐ A. 6
- ☐ B. 5
- ☐ C. 8
- ☐ D. 7

The amplifier shown in the figure below is **a common.....**



Select one:

- ☐ A. gate
- ☒ B. source
- ☐ C. collector
- ☐ D. base

What happens to the transconductance g_m of a MOSFET when the drain current I_D is doubled in saturation?

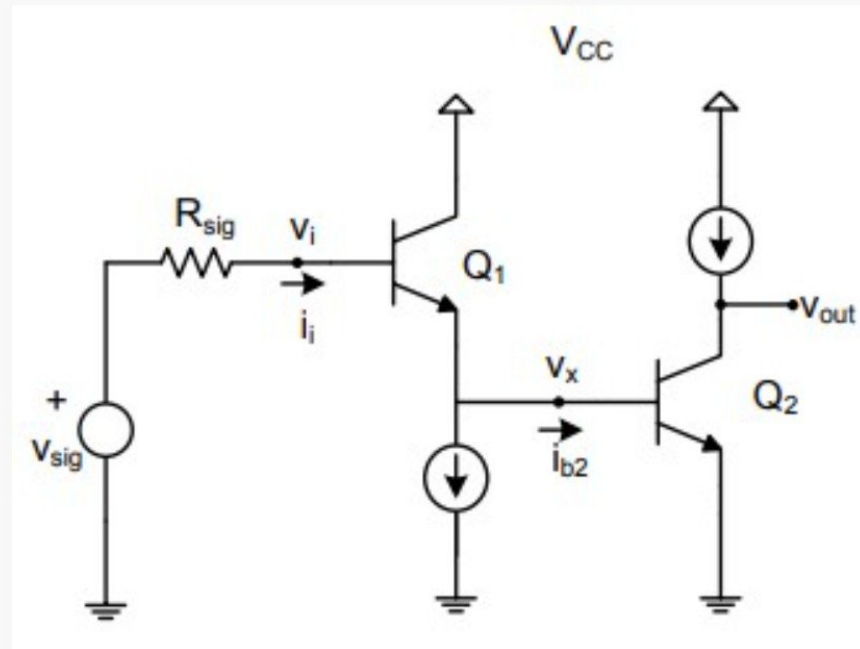
☒ It increases by a factor of $\sqrt{2}$

☐ It is doubled

☐ It remains constant

☐ It is halved

The circuit shown below uses transistors that are biased such that for both BJTs, $g_m = 25 \text{ mA/V}$, $\beta = 90$, and $r_o = 100 \text{ k}\Omega$. The two current sources used to bias the BJTs have small-signal output resistances equal to $50 \text{ k}\Omega$. The signal source resistance is $R_{\text{sig}} = 100 \text{ k}\Omega$. **Find the input resistance of the CE stage, v_x / i_{b2} (in $\text{k}\Omega$).**



Select one:

- ☐ A. 3.0
- ☐ B. 9.0
- ☐ C. 4.5
- ☐ D. 3.6

In semiconductor physics, what is meant by the term “mobility”?

- ☐ The probability of electron recombination
- ☐ The velocity of charge carriers in response to an electric field
- ☐ The interaction between phonons and electrons
- ☐ The distance charge carriers can move without scattering

What type of impurity is added to create a p-type semiconductor?

- ☐ Trivalent impurity
- ☐ Pentavalent impurity
- ☐ Univalent impurity
- ☐ Divalent impurity

Question 12

Not yet answered

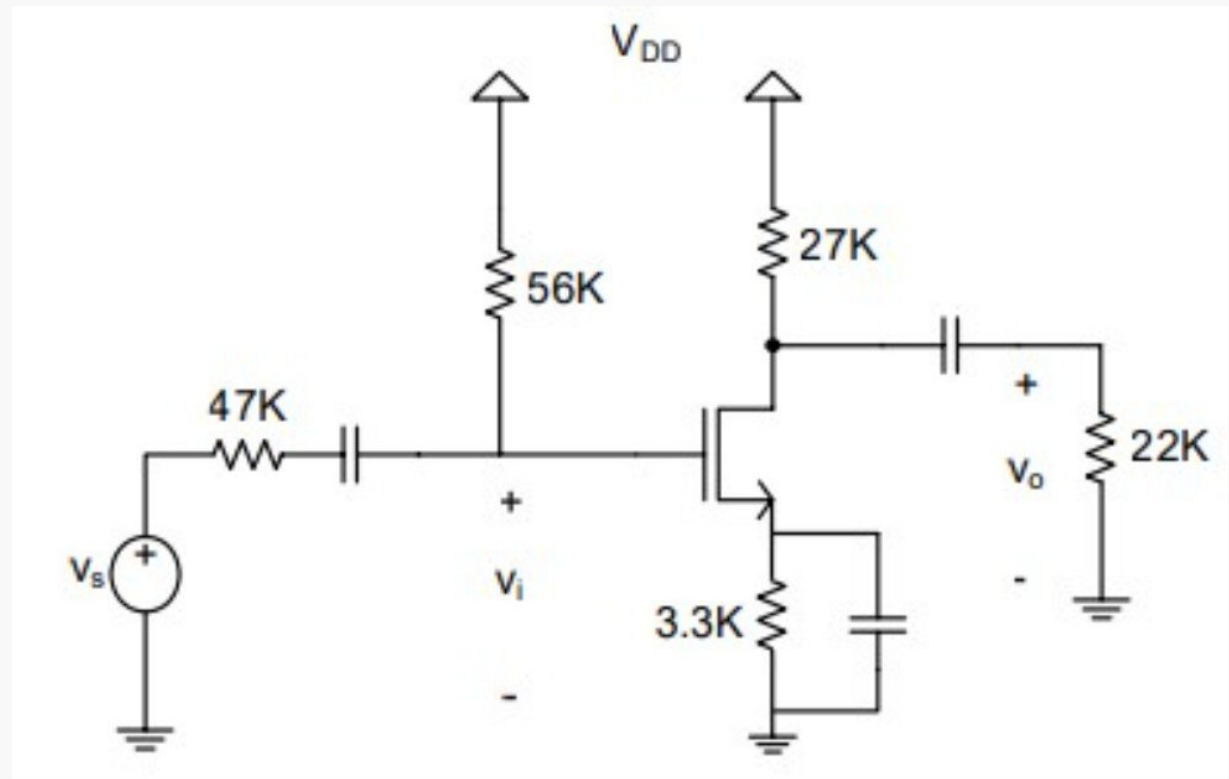
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 Flag question

What does the parameter λ (lambda) represent in MOSFET channel-length modulation?

- ☐ The change in drain current with respect to V_{DS}
- ☐ The threshold voltage variation
- ☐ The capacitance of the gate oxide
- ☐ The proportionality constant for transconductance

Consider the shown MOSFET amplifier. Find the input resistance (in K Ω).



Select one:

- ☐ A. 68
- ☐ B. 56
- ☐ C. 82
- ☐ D. 47

The source follower typically provides a voltage gain that is:

- ☐ Greater than one
- ☐ Negative
- ☐ Exactly unity
- ☐ Less than unity

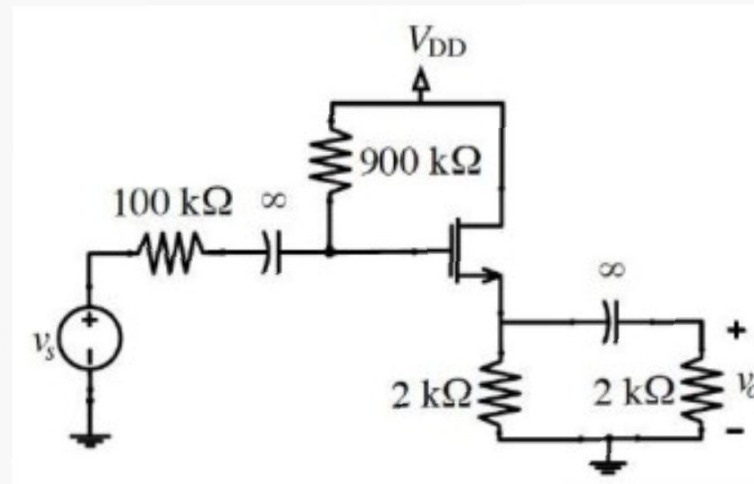
Question 13

Not yet answered

Marked out of 5

Flag question

The NMOS in the circuit shown below is biased in the saturation region such that the gate to source overdrive voltage V_{OV} is 0.5 V and the drain current $I_D = 1$ mA. If $v_s = 60$ mV peak-to-peak sinusoid, **find the peak-to-peak variation of v_o (in mV)**. Assume that $\lambda = 0$.



Select one:

- ☐ A. 28.8
- ☐ B. 43.2
- ☐ C. 50.4
- ☐ D. 36.0

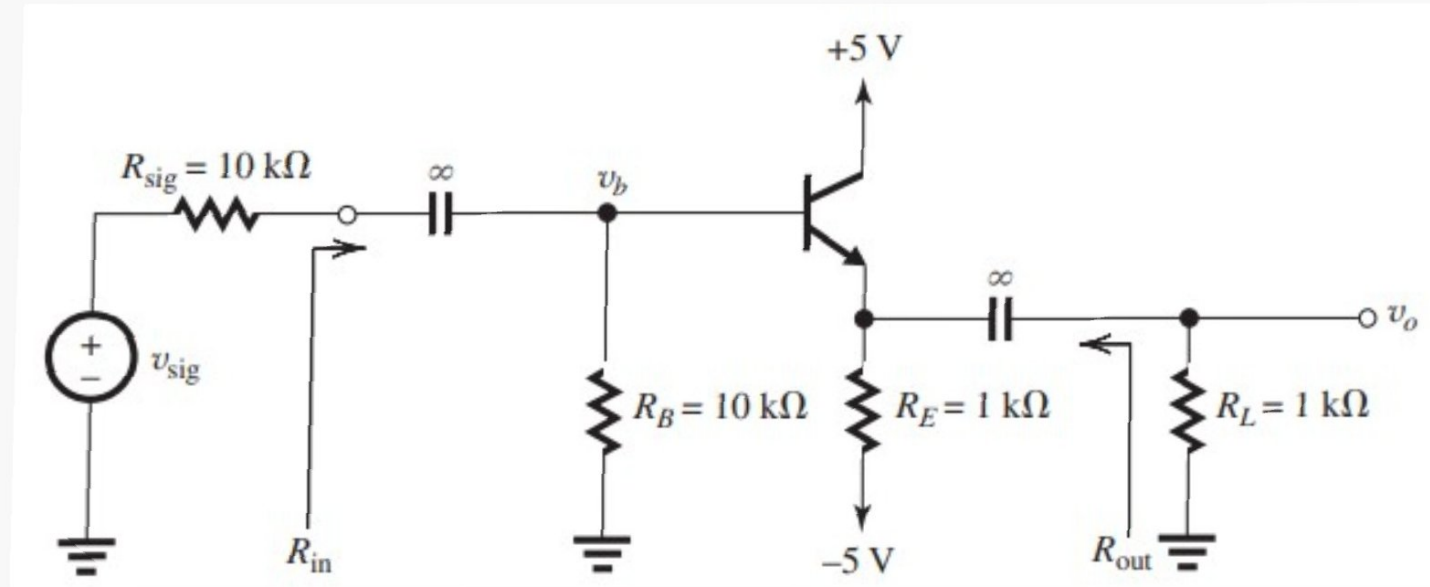
Question 17

Not yet answered

Marked out of 5

Flag question

The transistor in the emitter follower has $\beta = 100$. Assume $V_{BE} = 0.7 \text{ V}$, $V_T = 25 \text{ mV}$ and neglect the Early effect. Find the overall voltage gain, v_o/v_{sig} .



Select one:

- ☐ A. $v_o/v_{sig} = 0.89 \text{ V/V}$
- ☐ B. $v_o/v_{sig} = 0.94 \text{ V/V}$
- ☐ C. $v_o/v_{sig} = 0.449 \text{ V/V}$
- ☐ D. $v_o/v_{sig} = 0.49 \text{ V/V}$

Question **18**

Not yet answered

Marked out of 1

🚩 Flag question

In a bipolar junction transistor, what happens to the small-signal transconductance g_m if the collector current I_C increases?

- ☐ g_m increases
- ☐ g_m becomes negative
- ☐ g_m decreases
- ☐ g_m remains the same

Question **19**

Not yet answered

Marked out of 1

🚩 Flag question

What is the main drawback of using a current mirror with channel-length modulation?

- ☐ Increased noise
- ☐ Lower transconductance
- ☐ Increased power consumption
- ☐ Reduced output current accuracy

Question **20**

Not yet answered

Marked out of 1

🚩 Flag question

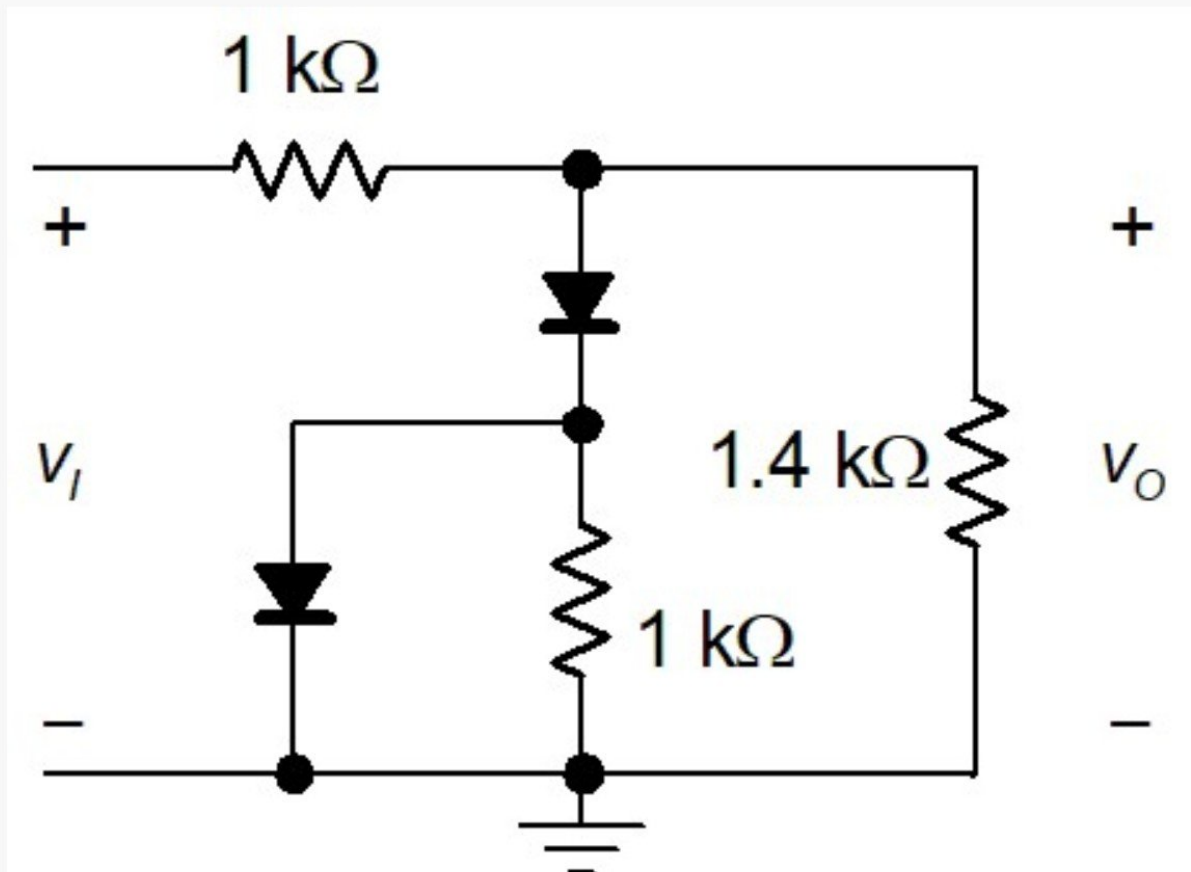
In a transistor switch, when the base-emitter junction is reverse biased, the transistor is in:

The potential barrier across a PN junction doped such that $N_A = 2a \cdot n_i$, and $N_D = 3a \cdot n_i$, is $20V_T$. Find the value of A.

Select one:

- ☐ A. 8992
- ☐ B. 40300
- ☐ C. 66400
- ☐ D. 24400

In the circuit shown, the diodes can be modeled in the forward direction by $V_{D,on} = 0.7\text{ V}$. At what value of v_i (not v_o) will limiting just begin?



Select one:

- ☐ A. 1.4 V
- ☐ B. 1.2 V
- ☐ C. 2.4 V
- ☐ D. 0.7 V

Not yet answered

Marked out of 1

Flag question

The concentration of holes in a p-type semiconductor is proportional to the:

- ☐ Doping concentration
- ☐ Intrinsic carrier concentration
- ☐ Electron concentration
- ☐ Product of the electron concentration and the intrinsic carrier concentration

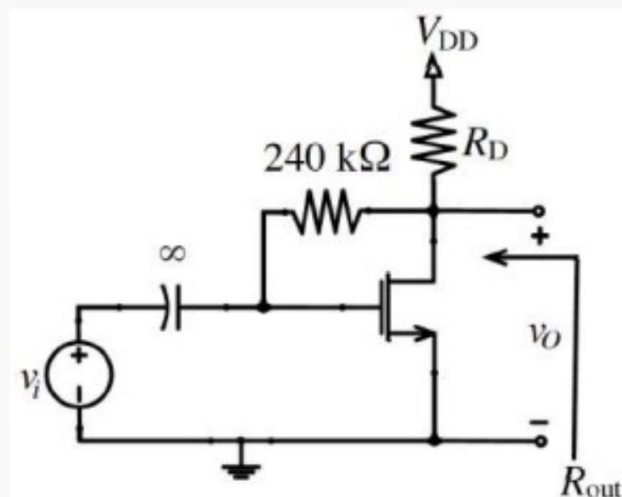
Question 24

Not yet answered

Marked out of 5

Flag question

The NMOS in the circuit shown below has an early voltage $V_A = 75$ V; it is biased in the saturation region such that $I_D = 1$ mA and $V_{DS} = 5$ V. If $R_{out} = 10$ k Ω , find the value of R_D (in k Ω).



Select one:

- ☐ A. 25.71
- ☐ B. 9.23
- ☐ C. 12
- ☐ D. 18.26

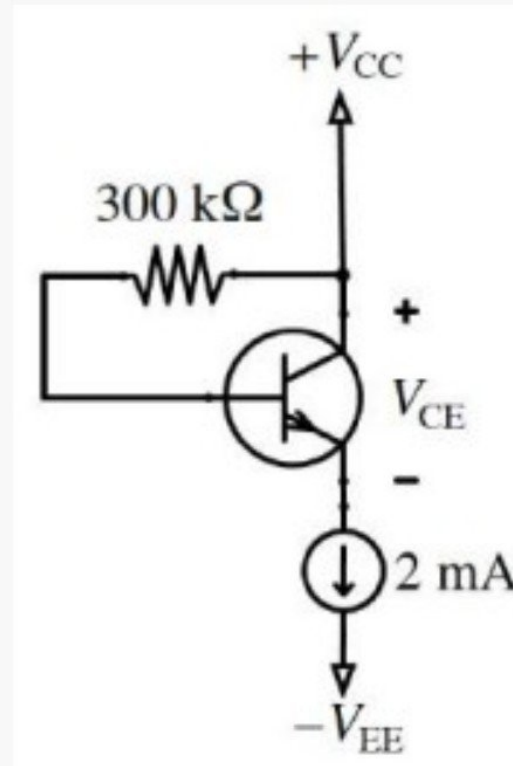
Which type of amplifier is most suitable for impedance matching between high and low impedance stages?

- ☐ Common-collector amplifier
- ☐ Common-emitter amplifier
- ☐ Differential amplifier
- ☐ Common-base amplifier

The concentration of holes in a p-type semiconductor is proportional to the:

- ☐ Doping concentration
- ☒ Intrinsic carrier concentration
- ☐ Electron concentration
- ☐ Product of the electron concentration and the intrinsic carrier concentration

The npn transistor in the circuit shown below is biased such that $V_{CE} = 4.7\text{ V}$, $V_{BE} = 0.7\text{ V}$. Find the value of β .



Question 27

Not yet answered

Marked out of 1

🚩 Flag question

What happens to the output voltage of a common-emitter amplifier if the load resistance increases?

- ☐ It becomes negative.
- ☐ It decreases.
- ☒ It increases.
- ☐ It remains the same.

Question 28

Not yet answered

Marked out of 1

🚩 Flag question

In a common-emitter amplifier, the collector current depends on:

- ☐ Both A and B
- ☐ The base-emitter voltage V_{BE}
- ☐ The temperature
- ☐ The collector-emitter voltage V_{CE}

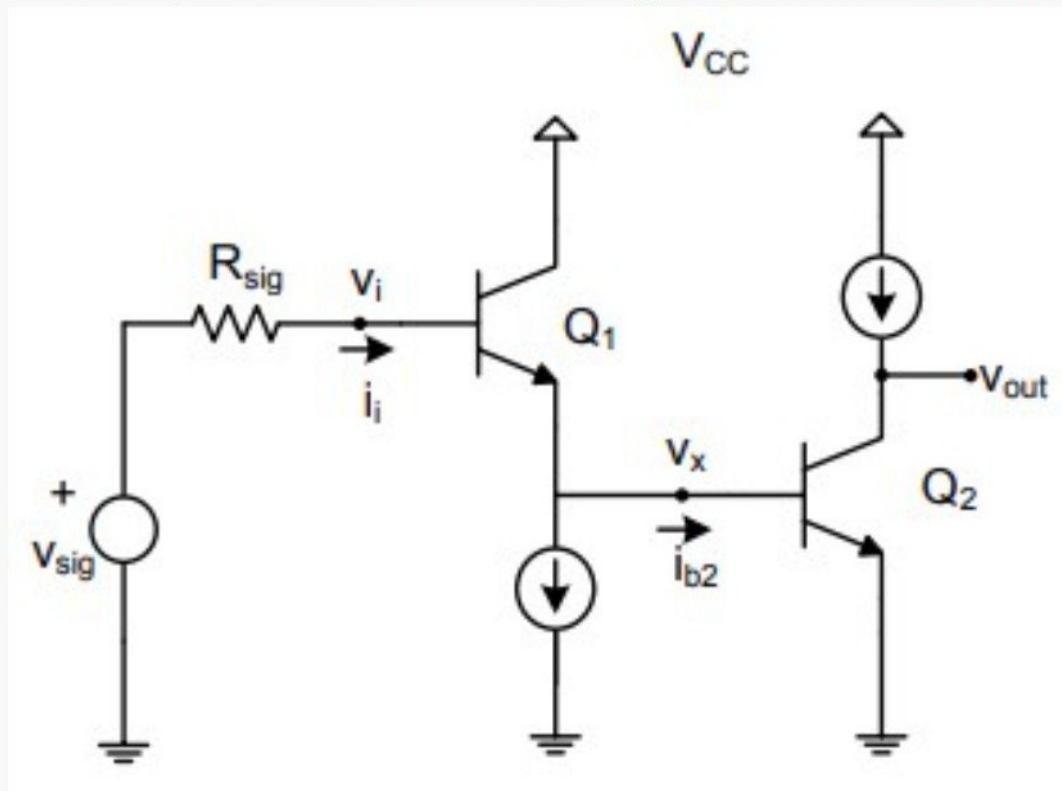
Question 30

Not yet answered

Marked out of 7

Flag question

The amplifier shown in the figure below is



Select one:

- ☐ A. common collector - common emitter
- ☐ B. common emitter - common base
- ☐ C. common base - common emitter
- ☐ D. common base - common collector

Question 11

Answer saved

Marked out of 1

🚩 Flag
question

What type of impurity is added to create a p-type semiconductor?

- ☒ Trivalent impurity
- ☐ Pentavalent impurity
- ☐ Univalent impurity
- ☐ Divalent impurity

Question 12

Answer saved

Marked out of 1

🚩 Flag
question

What does the parameter λ (lambda) represent in MOSFET channel-length modulation?

- ☒ The change in drain current with respect to V_{DS}
- ☐ The threshold voltage variation
- ☐ The capacitance of the gate oxide
- ☐ The proportionality constant for transconductance

إلكترونيات 1 امتحان نهائي نموذج 2

عدد الاسئلة: 14 سؤال
المدة: ساعتين

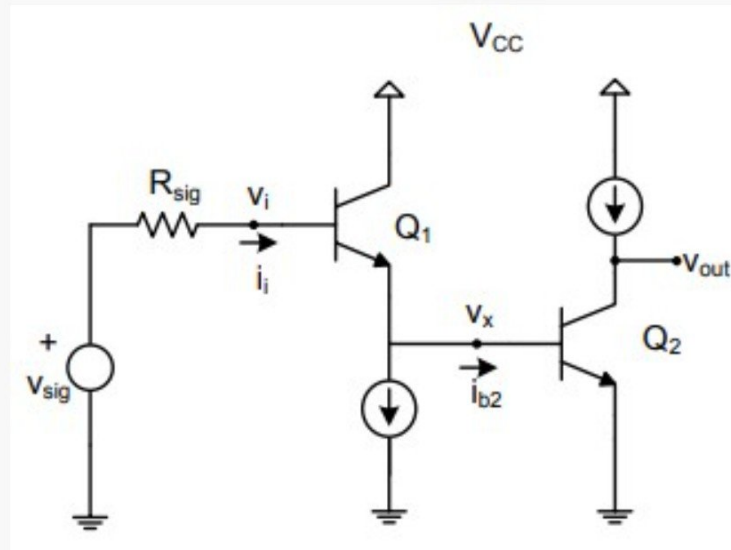
Question 1

Not yet answered

Marked out of 5

Flag question

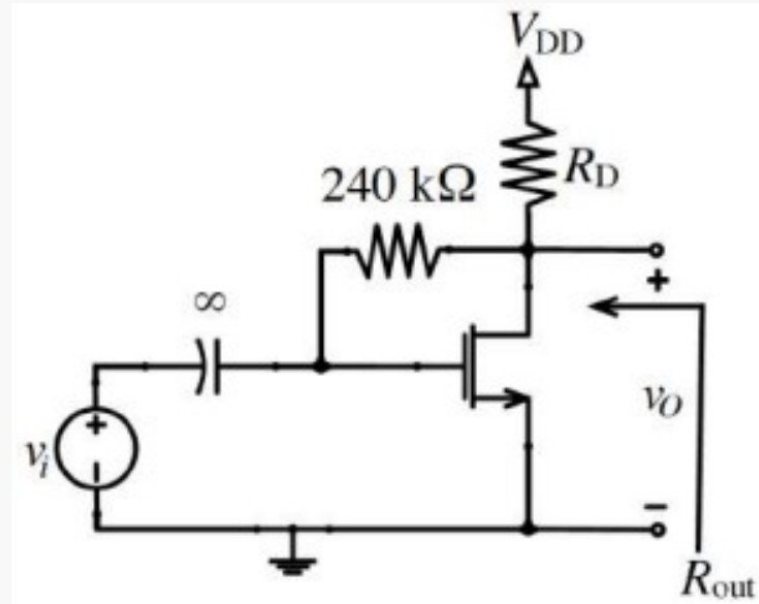
The circuit shown below uses transistors that are biased such that for both BJTs, $g_m = 25 \text{ mA/V}$, $\beta = 90$, and $r_o = 100 \text{ k}\Omega$. The two current sources used to bias the BJTs have small-signal output resistances equal to $50 \text{ k}\Omega$. The signal source resistance is $R_{\text{sig}} = 100 \text{ k}\Omega$. Find the gain of the CE stage, v_{out} / v_x .



Select one:

- ☐ A. - 833.3
- ☐ B. - 666.7
- ☐ C. - 333.3
- ☐ D. - 1000

The NMOS in the circuit shown below has an early voltage $V_A = 75$ V; it is biased in the saturation region such that $I_D = 1$ mA and $V_{DS} = 5$ V. If $R_D = 20$ k Ω and $g_m = 1.2$ mA/V, **find the voltage gain v_o/v_i (in V/V);**



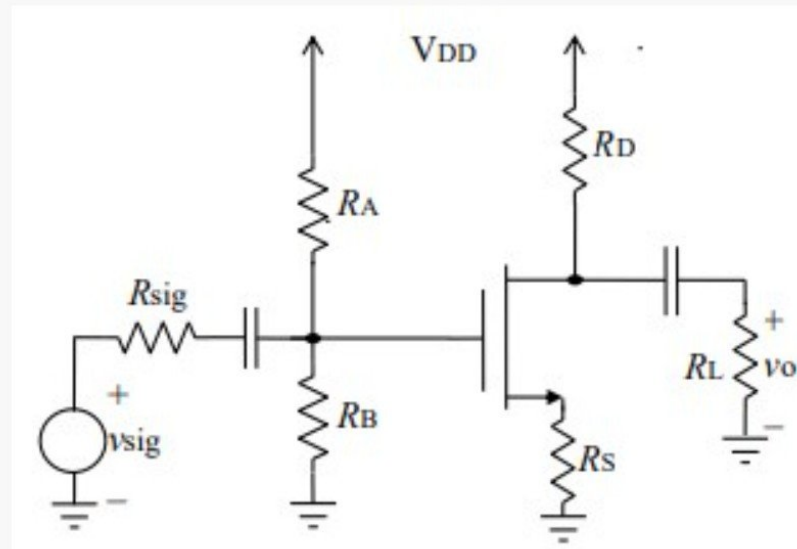
Select one:

- ☐ A. - 17.94
- ☐ B. - 20.94
- ☐ C. - 14.94
- ☐ D. - 26.94

What is the effect of channel-length modulation in a common-source amplifier?

- ☐ Decreases the output impedance
- ☐ Increases the gain
- ☐ Affects the voltage gain
- ☐ Causes thermal instability

In the circuit shown below, the transistor is biased in the saturation region. $\lambda = 0$, $\mu_n C_{ox} \frac{W}{L} = 0.5 \text{ mA/V}^2$, $R_A = R_B = 380 \text{ k}\Omega$, $R_{\text{sig}} = 10 \text{ k}\Omega$, $R_D = 8 \text{ k}\Omega$, $R_L = 12 \text{ k}\Omega$, and $R_S = 1.4 \text{ k}\Omega$. If the transconductance $g_m = 1 \text{ mA/V}$ and v_{sig} is a 0.2 V peak-to-peak sinusoid, **find the peak-to-peak variation of v_{gs} (in mV).**

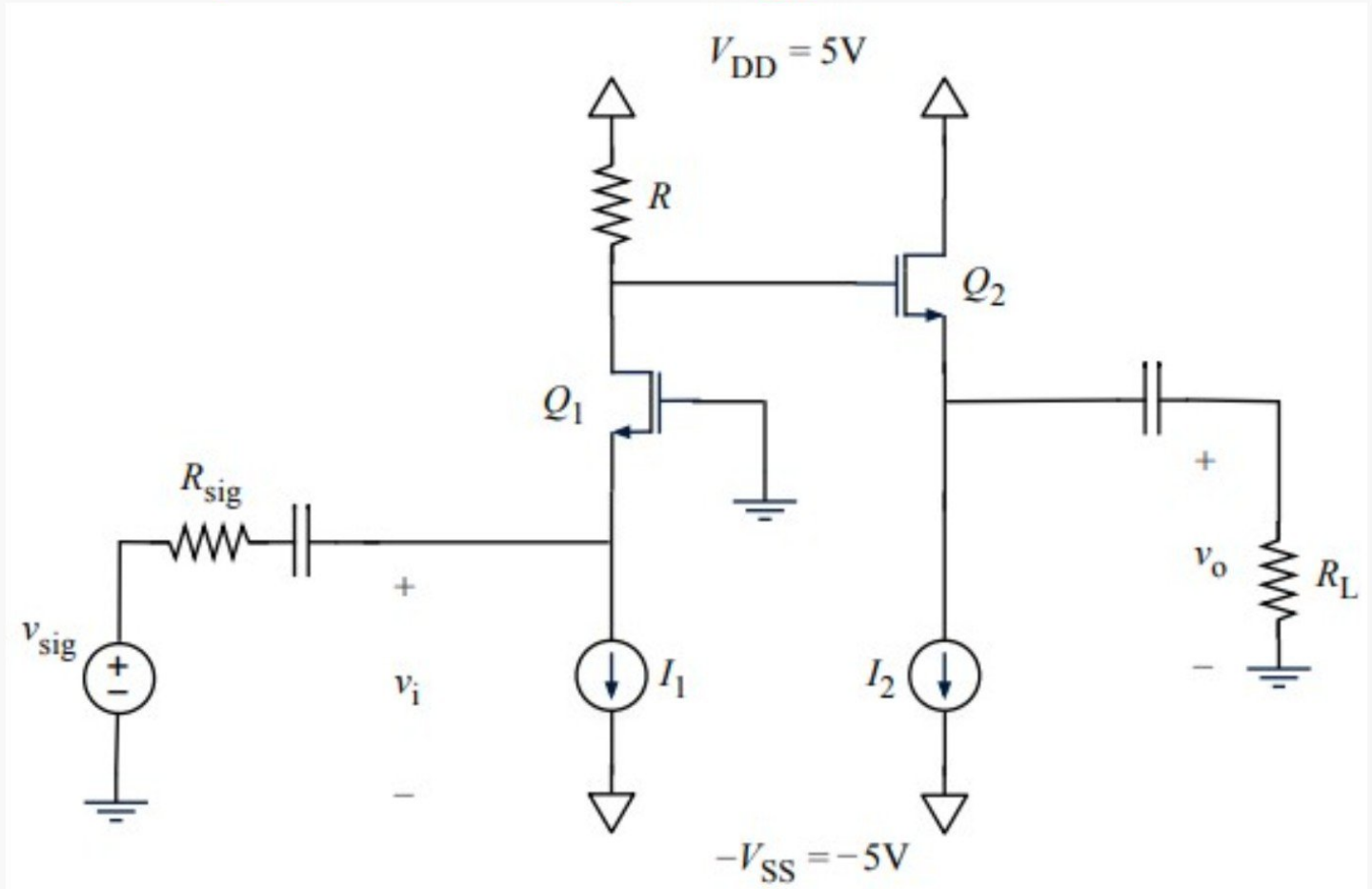


Select one:

- ☐ A. 79.2
- ☐ B. 73.08
- ☐ C. 118.75
- ☐ D. 86.36

In the circuit shown below, $I_1 = 0.1 \text{ mA}$, and $I_2 = 2I_1$. Assume $R_{\text{sig}} = R_L = 22 \text{ k}\Omega$. The two transistors have $\mu_n C_{ox} (W/L) = 1 \text{ mA/V}^2$.

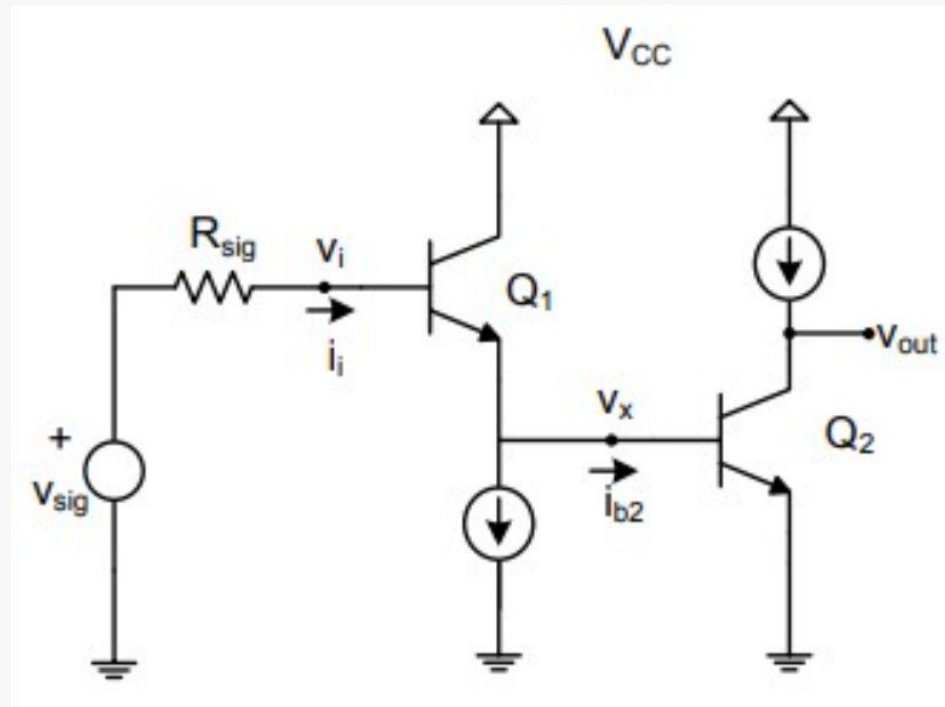
Find the output resistance of the amplifier, R_{out} (in Ω).



Select one:

- ☐ A. 907
- ☐ B. 1581
- ☐ C. 1118
- ☐ D. 791

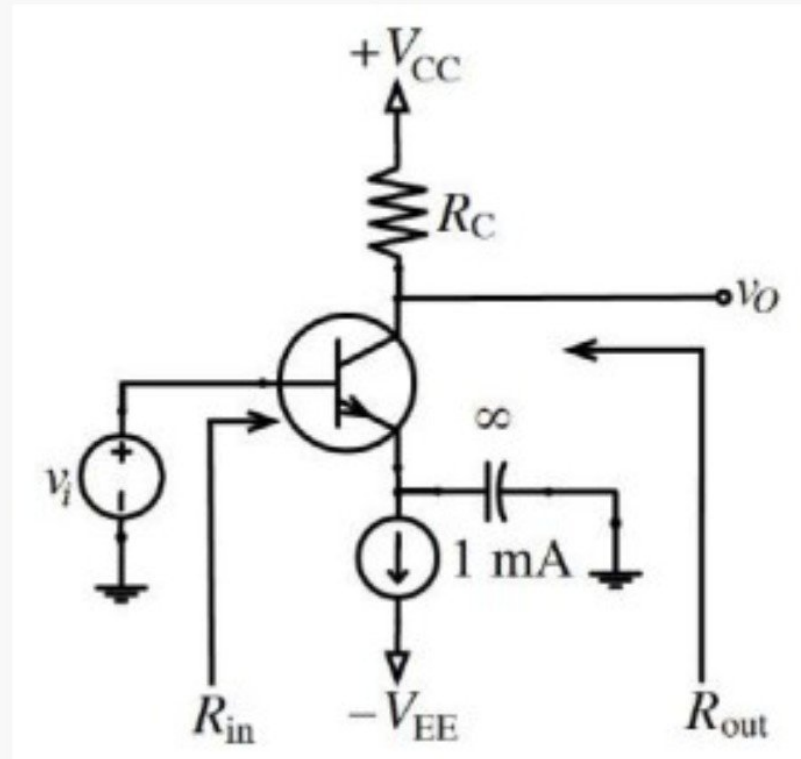
The circuit shown below uses transistors that are biased such that for both BJTs, $g_m = 25 \text{ mA/V}$, $\beta = 90$, and $r_o = 100 \text{ k}\Omega$. The two current sources used to bias the BJTs have small-signal output resistances equal to $50 \text{ k}\Omega$. The signal source resistance is $R_{\text{sig}} = 100 \text{ k}\Omega$. Find the gain of the CE stage, v_{out} / v_x .



Select one:

- ☐ A. - 833.3
- ☐ B. - 666.7
- ☐ C. - 333.3
- ☐ D. - 1000

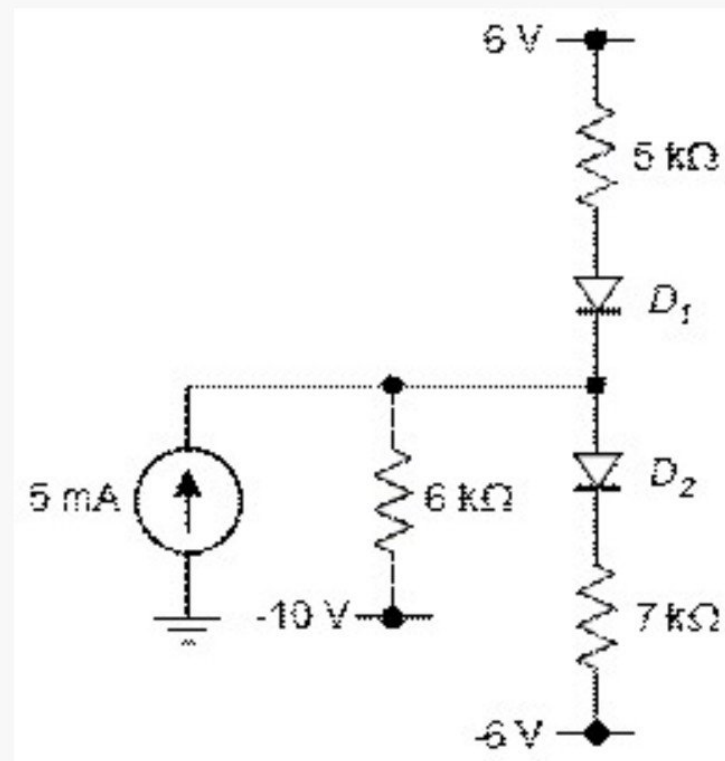
The npn transistor in the circuit shown below is biased in the active region. The voltage gain $v_o/v_i = -43.56$ V/V. Find the value of R_{out} (in $k\Omega$) if $\beta = 99$.



Select one:

- ☐ A. 1.3
- ☐ B. 1.1
- ☐ C. 1.5
- ☐ D. 1.2

Determine the diode currents I_{D1} and I_{D2} in the circuit shown, assuming ideal diode switches.



Select one:

- ☐ A. $I_{D1} = 1\text{mA}$ and $I_{D2} = 0$
- ☐ B. $I_{D1} = 2\text{mA}$ and $I_{D2} = 1\text{mA}$
- ☐ C. $I_{D1} = 1\text{mA}$ and $I_{D2} = 1\text{mA}$
- ☒ D. $I_{D1} = 0$ and $I_{D2} = 2\text{mA}$

Question 8

Not yet
answered

Marked out of 1

🚩 Flag
question

The output impedance of a source follower is typically:

- ☐ Low
- ☐ Infinite
- ☐ Equal to $1/g_m$
- ☐ High

Question 9

Not yet
answered

Marked out of 1

🚩 Flag
question

What is the output impedance of a common-gate amplifier without channel-length modulation?

- ☐ r_O
- ☐ $\frac{1}{g_m} + R_D$
- ☐ R_D
- ☐ $R_D || r_O$

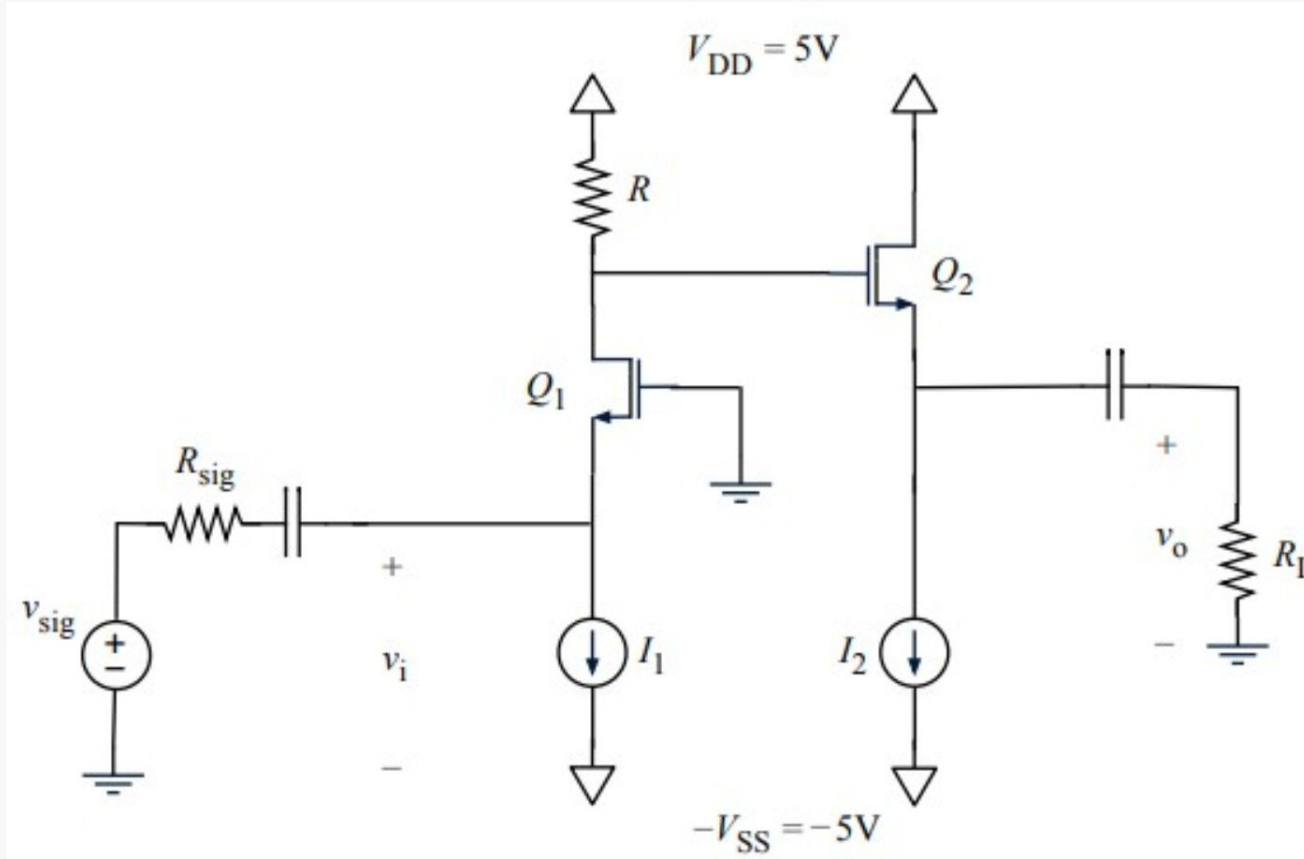
Question 10

Not yet
answered

Marked out of 2

Flag
question

In the circuit shown below, the Q_1 stage is a common-..... stage, and the Q_2 stage is a common-..... stage



Select one:

- ☐ A. gate, source
- ☐ B. gate, drain
- ☐ C. source, drain
- ☐ D. drain, gate

Question 11

Not yet
answered

Marked out of 1

🚩 Flag
question

In a source follower, if the transconductance g_m is increased, the voltage gain will:

- ☐ Increase
- ☐ Decrease
- ☐ Remain constant
- ☐ Become negative

Question 12

Not yet
answered

Marked out of 1

🚩 Flag
question

The reverse breakdown in a pn junction occurs due to which phenomenon?

- ☐ Tunneling effect
- ☐ Avalanche breakdown
- ☐ Punch-through effect
- ☐ Zener breakdown

Question 13

Not yet
answered

Marked out of 1

Flag
question

The reverse saturation current I_S is temperature dependent, and it:

- ☐ Increases linearly with temperature
- ☐ Decreases exponentially with temperature
- ☐ Remains constant with temperature
- ☐ Increases exponentially with temperature

Question 14

Not yet
answered

Marked out of
6

Flag
question

A PN junction diode is formed by doping the P type at a density $N_A = 4 \times 10^{16} \text{ cm}^{-3}$ and the N type at a density $N_D = 5 \times 10^{17} \text{ cm}^{-3}$. Assume $V_T = 25 \text{ mV}$ and $n_i \approx 1.25 \times 10^{10} / \text{cm}^3$. Find the potential barrier (in V) at $T = 273 \text{ K}$, when the doping density of acceptors is increased to $7 \times 10^{16} \text{ cm}^{-3}$.

Select one:

- ☐ A. 0.785
- ☐ B. 0.778
- ☐ C. 0.758
- ☐ D. 0.769

Question 15

Not yet answered

Marked out of 1

🚩 Flag question

What is the primary disadvantage of a common-emitter amplifier with large voltage gain?

- ☐ High input impedance
- ☐ Limited bandwidth
- ☐ Low output impedance
- ☐ High power dissipation

Question 16

Not yet answered

Marked out of 1

🚩 Flag question

The conduction band in a semiconductor is:

- ☐ Partially filled with holes at room temperature
- ☐ Empty at absolute zero
- ☐ Full of electrons at absolute zero
- ☐ Partially filled with electrons at room temperature

Question 17

Not yet answered

Marked out of 6

🚩 Flag question

A doped semiconductor has an acceptor concentration of 10^{18} cm^{-3} . The intrinsic density is $1.5 \times 10^{10} \text{ cm}^{-3}$. The mobility of holes is $500 \text{ cm}^2/\text{Vs}$ and that of free electrons is $1300 \text{ cm}^2/\text{Vs}$. The elementary charge q is $1.6 \times 10^{-19} \text{ C}$.

Find the density of free electrons (in cm^{-3})

Select one:

- ☐ A. 225
- ☐ B. 10^{18}
- ☐ C. 1.5×10^{10}
- ☐ D. 10^{20}

Which current is the primary current that flows through the collector in a bipolar transistor?

- ☐ Emitter current.
- ☐ Recombination current.
- ☐ Base current.
- ☐ Injection current.

Question **19**

Not yet answered

Marked out of 1

🚩 Flag question

What is the typical small-signal equivalent resistance seen at the collector of a BJT, excluding the load resistance?

- ☐ R_C
- ☐ r_π
- ☐ R_E
- ☐ r_o

Question **20**

Not yet answered

Marked out of 1

🚩 Flag question

The output characteristics of a BJT are:

- ☐ A plot of I_C versus V_{CE} for various values of I_B
- ☐ A plot of I_B versus I_C
- ☐ A plot of I_B versus V_{BE}
- ☐ A plot of I_E versus V_{CE}

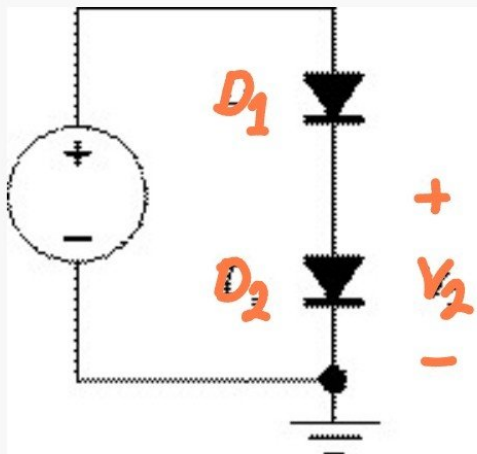
Question 21

Not yet answered

Marked out of 7

Flag question

The characteristics of both diodes are such that at equal diode voltages $I_{D1} = 2I_{D2}$. Assume $V_T = 25$ mV. The battery voltage is 1.5 V. **What is the value of V_2 ?**



Select one:

- ☐ A. 0.910 V
- ☐ B. 0.759 V
- ☐ C. 0.835 V
- ☐ D. 0.607 V

Question **22**

Not yet answered

Marked out of 1

🚩 Flag question

What happens to the number of charge carriers in a semiconductor as temperature increases?

- ☐ Remains constant
- ☐ Increases
- ☐ Drops to zero
- ☐ Decreases

Question **23**

Not yet answered

Marked out of 1

🚩 Flag question

What is the impact of the Early effect on a bipolar junction transistor's output characteristics?

- ☐ Reduces the current gain
- ☐ Reduces the output impedance
- ☐ Reduces the collector current
- ☐ Reduces the base-emitter voltage

Question 24

Not yet answered

Marked out of 7

🚩 Flag question

The drain current of an enhancement N-channel MOSFET is measured at several values of V_{GS} and V_{DS} , as shown in the table below. Find the Early Voltage $V_A = 1/\lambda$ (in V).

V_{GS} (V)	V_{DS} (V)	I_D (mA)
2	3	0.393
2	5	0.454
3	3	1.433
3	0.1	I_X

Select one:

- ☐ A. 10
- ☐ B. 8
- ☐ C. 12
- ☐ D. 14

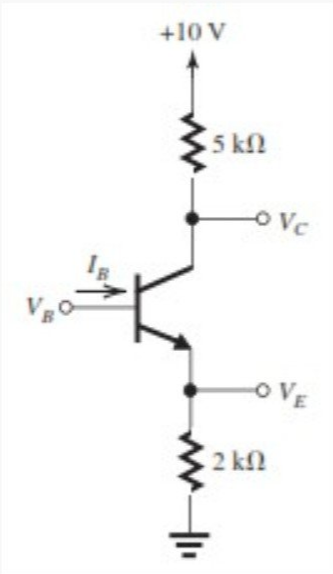
Question 25

Not yet answered

Marked out of 6

Flag question

The BJT in the circuit in the Fig. has $\beta = 100$. IF $V_B = 3\text{ V}$, **find V_E , V_C and I_B**



Select one:

- ☐ A. $V_E = +2.3\text{V}$, $V_C = +4.3\text{V}$ and $I_B = 0.01\text{ mA}$
- ☐ B. $V_E = +3\text{V}$, $V_C = +5\text{V}$ and $I_B = 0.03\text{ mA}$
- ☐ C. $V_E = +3.7\text{V}$, $V_C = +5.7\text{V}$ and $I_B = 0.02\text{ mA}$
- ☐ D. $V_E = -2.3\text{V}$, $V_C = +5.3\text{V}$ and $I_B = 0.01\text{ mA}$

Question 26

Not yet
answered

Marked out of 1

Flag
question

Which type of semiconductor material has an excess of electrons?

- ☐ Ionic semiconductor
- ☐ p-type semiconductor
- ☐ n-type semiconductor
- ☐ Intrinsic semiconductor

Question 27

Not yet
answered

Marked out of 7

Flag
question

A particular MOS operating in the saturation region has an output resistance (r_o) of $50 \text{ k}\Omega$ at $I_D = 1 \text{ mA}$ and $V_{DS} = 3 \text{ V}$. Find the Early voltage V_A (in V) of this MOS.

Select one:

- ☐ A. 37
- ☐ B. 52
- ☐ C. 47
- ☐ D. 57

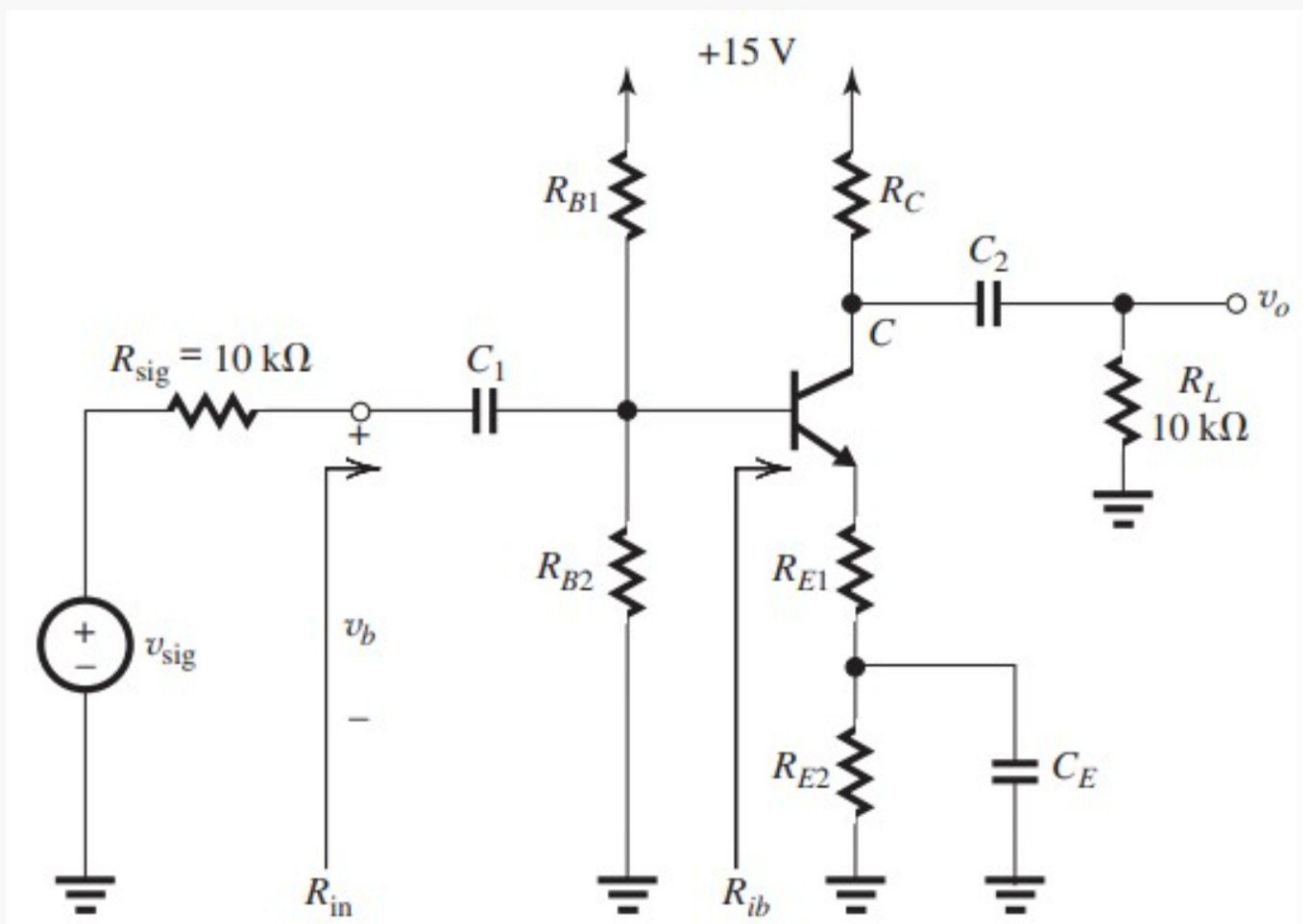
Question 28

Not yet answered

Marked out of 5

Flag question

The BJT has $\beta = 99$, $V_T = 25$ mV and the Early effect can be neglected. Assume $V_{BE} = 0.7$ V. If the input resistance at the base, R_{ib} , is to be 10 k Ω , **find the required value of R_{E1} and hence the value of R_{E2} .**



Select one:

- ☐ A. $R_{E1} = 100 \Omega$ and $R_{E2} = 5.5$ k Ω
- ☐ B. $R_{E1} = 75 \Omega$ and $R_{E2} = 4.225$ k Ω
- ☐ C. $R_{E1} = 2$ k Ω and $R_{E2} = 225 \Omega$
- ☐ D. $R_{E1} = 150 \Omega$ and $R_{E2} = 8.5$ k Ω

Question 29

Not yet answered

Marked out of 1

🚩 Flag question

In CMOS technology, what is the purpose of the n-well?

- ☐ To isolate PMOS transistors from the substrate
- ☐ To reduce the threshold voltage of NMOS transistors
- ☐ To increase the transconductance of NMOS transistors
- ☐ To increase the current capacity of PMOS transistors

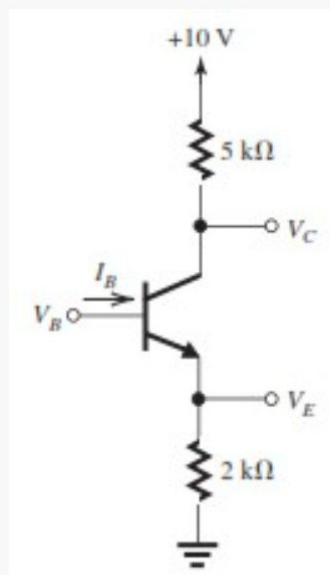
Question 30

Not yet answered

Marked out of 7

Flag question

The BJT in the circuit in the Fig. has $\beta = 100$. IF $V_B = 0$ V , **find V_E , V_C and I_B**



Select one:

- ☐ A. $V_E = 6\text{V}$, $V_C = +4\text{V}$ and $I_B = 0.5\text{ mA}$
- ☐ B. $V_E = 0\text{V}$, $V_C = +10\text{V}$ and $I_B = 0\text{ mA}$
- ☐ C. $V_E = +4\text{V}$, $V_C = +10\text{V}$ and $I_B = 0.5\text{ mA}$
- ☐ D. $V_E = 2\text{V}$, $V_C = +5\text{V}$ and $I_B = 0.1\text{ mA}$