**Student ID:_____Student Name: _____**

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**EHB222E INTRODUCTION TO ELECTRONICS**
**April 2021 🕓 08.30-10.30**
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1. For a BJT having an Early voltage of 50 V, what is its output resistance at 1 mA?

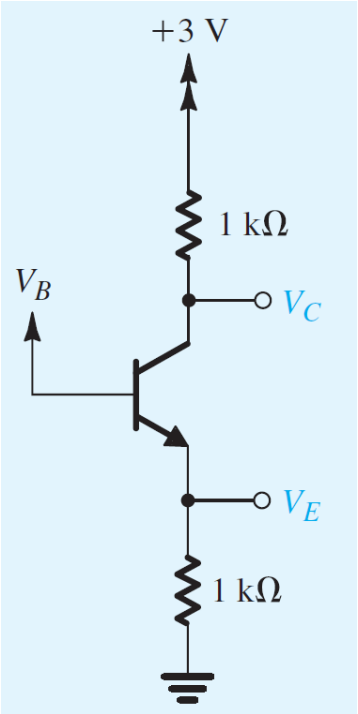
**Answer:**

**6.44** $r_o = \dfrac{V_A}{I_C} = \dfrac{50\text{ V}}{I_C}$

Thus,

At $I_C = 1\text{ mA}$, $r_o = \dfrac{50\text{ V}}{1\text{ mA}} = 50\text{ k}\Omega$

2. The transistor in the circuit has a very high β. Find the highest value of $V_B$ for which the transistor still operates in the active mode. $V_{BE}$ = 0.7V.




**Answer:**

**GOOD LUCK EVERYONE**

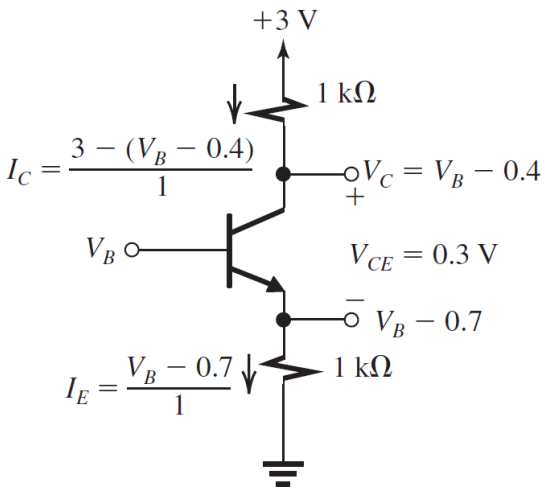



Figure 1

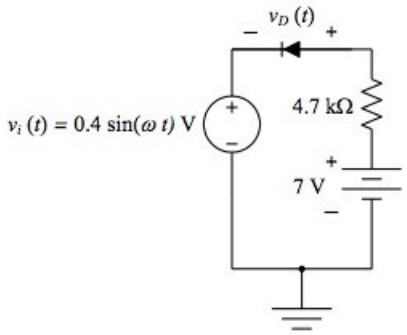
Figure 1 shows the circuit with the value of $V_B$ that results in operation at the edge of saturation. Since $\beta$ is very high,

$$I_C \simeq I_E$$

$$\frac{3-(V_B-0.4)}{1} = \frac{V_B-0.7}{1}$$

$$\Rightarrow V_B = 2.05 \text{ V}$$

3. Calculate $v_D(t)$ voltage of diode by using Modified Ideal Diode Model ($V_d$=0.7V)




The voltage drop across the diode is 0.7 volts, and the DC current through the diode is only determined by the resistor:

$$IDQ = \frac{7V - 0.7V}{4700\Omega} = 1.34mA$$

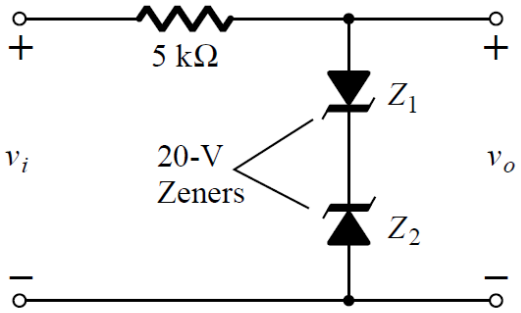
For the AC analysis you can use the differential resistance

$$r_d = \frac{kT}{qIDQ} \approx \frac{0.025}{IDQ}\Omega = 18.65\Omega \quad \text{(at room temperature)}$$

So for $v_D(t)$ we get

$$v_D(t) = -\frac{r_d}{r_d + 4700\Omega}0.4\sin(\omega t)V = -1.58\sin(\omega t)mV$$

4. What are the peak voltage values for both half cycles of the output waveform. V1={V1}sin(wt). Use modified ideal diode model ($V_d$=0.7V) for diodes.

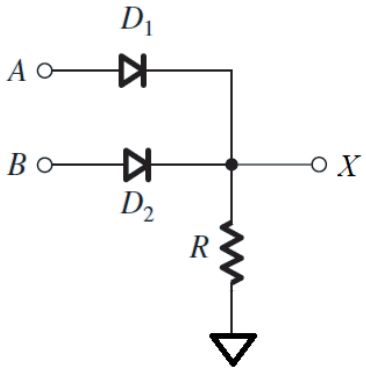



5. Zener diodes are employed in the design of …….. whose function is to provide a constant dc voltage that varies little with variations in power-supply voltage and/or load current.

A. voltage regulators
B. voltage transformators
C. current transformators
D. dependent current source
E. dependent voltage source

ANSWER:A

6. The circuit shown in figure can function as logic gate for input voltages that are either high or low. Using "1" to denote the high value and "0" to denote the low value, choose the resulting values of X in the options given below. (assume that diodes are ideal)




A.

| *A* | *B* | *X* |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

B.

| *A* | *B* | *X* |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

C.

| *A* | *B* | *X* |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

D.

| *A* | *B* | *X* |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

E.

| *A* | *B* | *X* |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

ANSWER:E

7. Rectifiers convert ac voltages into unipolar voltages. Full-wave rectifiers do this by …….
A. passing the voltage in positive half-cycle
B. passing the voltage in half of each cycle and inverting the voltage in the other half-cycle
C. passing the voltage in negative half-cycle
D. passing the voltage in positive quarter-cycle
E. passing the voltage in negative quarter-cycle
ANSWER:B

8. In a …… current flowing through load resistor is same directions for positive and negative cycles.
A. current regulator,
B. quarter-wave rectifier,
C. half-wave rectifier,
D. full-wave rectifier,
E. none of above
ANSWER:D

9. ……. has a smaller ripple than half-wave rectifier voltage for the same load resistance and capacitor values because the time between rectified wave' peaks is shorter.
A. In a filtered full-wave rectifier, the output voltage
B. In a non-filtered full-wave rectifier, the output voltage
C. In a non-filtered half-wave rectifier, the output voltage
D. In a non-filtered bridge rectifier, the output voltage
E. none of above
ANSWER:A

10. For amplifier applications, the BJT is operated in the ……..…. mode.
A. breakdown
B. cut-off
C. active
D. saturation
E. none of above
ANSWER:C

11. In the active mode, iC shows a slight dependence on vCE. This phenomenon, known as the …….. is modeled by ascribing a finite (i.e., noninfinite) output resistance to the BJT.
A. breakdown,
B. avalanche,
C. zener,
D. early effect,
E. none of above
ANSWER:D

12. Disadvantage of …… of a BJT transistor amplifier is that it is sensitive to changes in ß.
A. collector biasing
B. base biasing
C. emitter biasing
D. polar biasing
E. dual biasing
ANSWER:B