

# SOLVED EXERCISES SOLUTION

## MICROELECTRONIC CIRCUITS

### SEDRA SMITH

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#### Solved Exercises from Microelectronic Circuits by Sedra and Smith

**Question 1:** Calculate the quiescent collector current in an NPN transistor circuit with the following parameters:  $V_{CC} = 10\text{ V}$ ,  $R_E = 1\text{ k}\Omega$ , and  $R_C = 2\text{ k}\Omega$ .

**Answer:** Using the voltage divider rule, we find the voltage at the base:  $V_b = V_{CC} * R_E / (R_E + R_C) = 5\text{ V}$ . Then, the quiescent collector current is:  $I_c = (V_b - V_{BE}) / R_E = 4\text{ mA}$ .

**Question 2:** Design a voltage amplifier with a gain of 50 using an NPN transistor with  $\beta = 100$ .

**Answer:** Choose  $R_E = 1\text{ k}\Omega$  and  $R_C = 50\text{ k}\Omega$ . Then, the voltage gain is:  $A_v = -R_C / R_E = 50$ .

**Question 3:** Explain the operation of a common-source MOSFET amplifier.

**Answer:** The MOSFET amplifier amplifies the input voltage by controlling the drain current through the device. When the gate voltage increases, the drain current increases, resulting in an amplified output voltage.

**Question 4:** Find the output voltage of an operational amplifier circuit with the following configuration:  $R_1 = 10\text{ k}\Omega$ ,  $R_2 = 20\text{ k}\Omega$ , and  $V_{in} = 1\text{ V}$ .

**Answer:** Using the inverting amplifier formula, we obtain:  $V_{out} = -R_2 / R_1 * V_{in} = -2 V$ .

**Question 5:** Design a bandpass filter with a center frequency of 1 kHz and a quality factor of 10.

**Answer:** Choose a capacitor value of  $C = 159 \text{ nF}$  and a resistor value of  $R = 15.9 \text{ k}\Omega$ . Then, the center frequency is:  $f_0 = 1 / (2\pi RC) = 1 \text{ kHz}$  and the quality factor is:  $Q = f_0 / BW = 10$ .

**What is the lowest rated Tim Burton movie?** "Alice Through the Looking Glass" (2016) is Tim Burton's lowest-rated film. Summary: Alice (Mia Wasikowska) travels to the past in an attempt to save the Mad Hatter (Johnny Depp) and the rest of Wonderland from the Red Queen (Helena Bonham Carter).

**What is Tim Burton's art about?** Burton's message in much of his work is: stay true to yourself. His characters do this through creativity. Unfailingly, his heroes/protagonists use their imagination and/or imaginative activity as a response to feelings of disconnection and isolation.

**What is Tim Burton's style called?** Renowned filmmaker Tim Burton established his distinct "Burtonesque" visual style through a childhood fascination with the unearthly and grotesque.

**What was the last movie Tim Burton made?** Burton next directed the adventure fantasy Miss Peregrine's Home for Peculiar Children (2016), a film adaptation of the first book in a popular young adult series by Ransom Riggs. In 2019 he received mixed reviews for Dumbo, a live-action remake of the 1941 Disney classic.

**What movie is zero in Tim Burton?** Zero is the tritagonist of Tim Burton's 1993 stop-motion Disney film, The Nightmare Before Christmas. He is Jack Skellington's pet ghost dog.

**Which actor has been in the most Tim Burton movies?** The actors who collaborated with Burton the most frequently are Johnny Depp (8 films), Helena Bonham Carter (7 films), and Christopher Lee and Michael Gough (5 films each).

**Who was Tim Burton's idol?** LACMA also featured six films of Tim Burton's idol, Vincent Price.

**Did Tim Burton make Beetlejuice?** Director Tim Burton talks to Sky News at the London premiere of his new film, Beetlejuice Beetlejuice. Beetlejuice Beetlejuice is a long awaited sequel to the first film released in 1988.

**What was Tim Burton's life like?** He spent most of his childhood as a recluse, drawing cartoons, and watching old movies (he was especially fond of films with Vincent Price). When he was in the ninth grade, his artistic talent was recognized by a local garbage company, when he won a prize for an anti-litter poster he designed.

**Why is Tim Burton so famous?** Credited with kickstarting the juggernaut of superhero films (Batman, 1989; Batman Returns, 1992), reinvigorating stop-motion animation (Tim Burton's The Nightmare Before Christmas, 1993; Corpse Bride, 2005), putting a macabre twist on grand scale musicals (Sweeney Todd, 2007), and creating some of cinema's most iconic ...

**What does Tim Burton like to wear?** Burton loves using black and white stripes to create a striking contrast amidst his darker color palette. And you can do the same! Stripes get a bad reputation because of their visual impact. Horizontal stripes, for example, can have a widening effect that can make you look broader than you are.

**Why does Tim Burton use stop-motion?** Burton was compelled to utilize stop-motion animation because it could bring something purely imagined to vivid life in a way that 2-D animation couldn't.

**What is Tim Burton's biggest movie?** "Alice in Wonderland" is Burton's highest-grossing film, earning over \$1 billion, despite receiving mixed reviews.

**Was Helena Bonham Carter married to Tim Burton?** Though they were never officially married, the actress reflected on her and Burton's split as a "divorce."

**What movies did Tim Burton not make?**

**What is the oldest Tim Burton movie?** In 1985, following his departure from the Disney studios, he created his first feature film: Pee-Wee's Big Adventure. This was

followed by Beetlejuice (1988), Batman (1989), Edward Scissorhands (1990) and The Nightmare Before Christmas (1993).

**Who is Tim Burton's son?**

**Has Tim Burton made a horror movie?** He is known for his gothic horror and fantasy films, such as Beetlejuice (1988), Edward Scissorhands (1990), The Nightmare Before Christmas (1993), Ed Wood (1994), Sleepy Hollow (1999), Corpse Bride (2005), Sweeney Todd: The Demon Barber of Fleet Street (2007), Dark Shadows (2012), and Frankenweenie (2012).

**Who is Johnny Depp to Tim Burton?** He is the godfather to his friend Tim Burton and Helena Bonham Carter's son, Billy Burton.

**Why does Tim Burton cast Johnny Depp so much?** Several reasons. One is, they're both talented, versatile actors who are game for anything, including whatever weirdness Burton can dream up. Second, the Burton-Depp partnership has been very profitable, resulting in numerous hit movies, so it's no wonder that both of them would want to continue it....

**How many Tim Burton movies was Christopher Lee in?** He frequently appeared opposite his friend Peter Cushing in numerous horror films, and late in his career had roles in five Tim Burton films.

**What was Tim Burton's childhood like?** Born and raised in Burbank, California, the young Tim Burton spent a reclusive childhood drawing cartoons, reading books and watching old horror movies – particularly drawn to the work of Ray Harryhausen and Edgar Allan Poe.

**Why is Tim Burton's style so unique?** Much of this style is heavily influenced by German expressionist artists and filmmakers in the early 20th century (LACMA). Distortion, spooking shadows, heavy makeup, dreamlike settings, and some overarching feelings of dismay are characteristics of both Burton's work and German expressionism.

**Who is Tim Burton's daughter?**

**What is the lowest ranked movie of all time?**

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**What is the lowest rating for a movie?**

**What was Tim Burton's favorite type of movie as a child?** Burton grew up watching Japanese monster movies, and it's a love that he's passed down to his children.

**Has Tim Burton made a horror movie?** He is known for his gothic horror and fantasy films, such as Beetlejuice (1988), Edward Scissorhands (1990), The Nightmare Before Christmas (1993), Ed Wood (1994), Sleepy Hollow (1999), Corpse Bride (2005), Sweeney Todd: The Demon Barber of Fleet Street (2007), Dark Shadows (2012), and Frankenweenie (2012).

**What is the #1 best movie ever?** 1. Citizen Kane (1941)

**What's the most forgotten movie?**

**What movie has 100% on Rotten Tomatoes?** To date, Leave No Trace holds the site's record, with a rating of 100% and 252 positive reviews.

**What is worse than rated R?** The NC-17 rating is the highest rating (even higher than the R-rating) that a film can be given, and it means the movie is for adults only (ages 18 and older) and no one age 17 or younger will be admitted. This rating, prior to 1990, was previously rated X.

**What is a U-rated movie?** U certificate Films with the U certification are fit for unrestricted public exhibition and are family-friendly. These films can contain universal themes like education, family, drama, romance, sci-fi, action etc. These films can also contain some mild violence, but it cannot be prolonged.

**Has any movie gotten 0 on Rotten Tomatoes?** On the film review aggregation website Rotten Tomatoes, films that every surveyed critic considered bad have a 0% rating. As of 2023, only 40 films with more than 20 reviews have received this rating.

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**What was Tim Burton's first Disney movie?** While at Disney in 1982, Burton made his first short, Vincent, a six-minute black-and-white stop motion film based on a poem written by Burton, which depicts a young boy who fantasizes that he is his hero Vincent Price, with Price himself providing narration.

**Was Helena Bonham Carter married to Tim Burton?** Though they were never officially married, the actress reflected on her and Burton's split as a "divorce."

**What is the darkest Tim Burton movie?**

**What movies did Tim Burton not make?**

**Who is Tim Burton's son?**

## **Tutorial Version 1: Chillers**

**What is a Chiller?**

A chiller is a machine that removes heat from a liquid or gas, cooling it to a specific temperature. Chillers are used in a variety of applications, including air conditioning, refrigeration, and industrial processes.

**How does a Chiller Work?**

Chillers work by using a refrigerant, which is a chemical that can absorb and release heat. The refrigerant is compressed in a compressor, which raises its temperature and pressure. The high-pressure refrigerant is then passed through a condenser, where it releases heat and condenses into a liquid. The liquid refrigerant then passes through an expansion valve, which reduces its pressure and temperature. The low-pressure refrigerant is then passed through an evaporator, where it absorbs heat and evaporates into a gas. The gas refrigerant is then compressed again, and the cycle repeats.

**What are the Different Types of Chillers?**

There are two main types of chillers: air-cooled chillers and water-cooled chillers. Air-cooled chillers use fans to circulate air over the condenser, while water-cooled chillers use water to cool the condenser. Water-cooled chillers are more efficient

than air-cooled chillers, but they require a source of water.

### **What are the Applications of Chillers?**

Chillers are used in a variety of applications, including:

- Air conditioning: Chillers are used to cool air in buildings.
- Refrigeration: Chillers are used to cool food and beverage products.
- Industrial processes: Chillers are used to cool water and other liquids used in industrial processes.

### **How do I Choose the Right Chiller?**

When choosing a chiller, it is important to consider the following factors:

- Capacity: The capacity of a chiller is measured in tons of refrigeration (TR). A TR is the amount of heat that can be removed by a chiller in one hour.
- Efficiency: The efficiency of a chiller is measured by the Energy Efficiency Ratio (EER). The higher the EER, the more efficient the chiller.
- Size: The size of a chiller is important to consider when selecting a location for the chiller.
- Cost: The cost of a chiller is an important factor to consider when making a purchase decision.

## **The Matlock Paper: Unraveling the Secrets of Robert Ludlum's Best-Seller**

### **Introduction:**

Robert Ludlum's "The Matlock Paper" captivates readers with its intricate plot and enigmatic characters. Central to the story is the eponymous document, a stolen file containing explosive secrets that could destabilize the global order. As readers delve into the novel, they encounter a series of questions that tantalize their curiosity.

### **Question 1: What is the Matlock Paper?**

Answer: The Matlock Paper is a top-secret document that was stolen from a British embassy by a mysterious organization known as Scorpio. It contains sensitive information about black budgets, weapon systems, and covert operations carried out

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by government agencies around the world.

### **Question 2: Who is Jonathan Ryder?**

Answer: Jonathan Ryder is a former marine who is hired to recover the Matlock Paper. He is a skilled operative with a complex past and a strong sense of justice. As he investigates the case, he becomes entangled in a web of intrigue and danger.

### **Question 3: What are the motives of Scorpio?**

Answer: Scorpio is a shadowy organization that operates outside the law. Its motives are unclear, but it is believed to be seeking to use the information in the Matlock Paper to gain power and influence over world events.

### **Question 4: What is the significance of the Arctic Circle?**

Answer: The Arctic Circle is a key location in the novel. It is where Ryder believes the Matlock Paper may be hidden. The Arctic Circle is also home to a secret research facility, which may hold the key to the document's true origins.

### **Conclusion:**

"The Matlock Paper" by Robert Ludlum is a gripping thriller that explores the dangerous world of espionage and international intrigue. Through his questions and answers, the reader unravels the secrets of the Matlock Paper and the motivations of those who seek to possess it. As the story unfolds, the lines between friend and foe blur, and the truth becomes elusive in a world where nothing is as it seems.

[the art of tim burton standard edition](#), [tutorial version 1 chillers](#), [the matlock paper](#)  
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