

Reading Comprehension Passage 30

This sample text has been prepared for the Master of Electrical Engineering entrance exam by Alpha Consulting Group.

Vacuum-channel transistor is the result of a marriage between traditional vacuum-tube technology and modern semiconductor-fabrication techniques. This curious hybrid combines the best aspects of vacuum tubes and transistors and can be made as small and as cheap as any solid state device. Indeed, making them small is what eliminates the well-known drawbacks of vacuum tubes.

In a vacuum tube, an electric filament is used to heat the cathode sufficiently for it to emit electrons. This is why vacuum tubes need time to warm up and consume so much power. It is also the reason they frequently burn out. However, vacuum-channel transistors do not need a filament or hot cathode. If the device is made small enough, the electric field across it is sufficient to draw electrons from the source by a process known as field emission.

Eliminating the power-sapping heating element reduces the area each device takes upon a chip and makes this new kind of transistor energy efficient. Another weak point of tubes is that they must maintain a high vacuum to avoid collisions between electrons and gas molecules. Under such low pressure, the electric field causes positive ions generated from the residual gas in a tube to accelerate and bombard the cathode, creating sharp, nanometer-scale protrusions, which degrade and, ultimately, destroy it.

These long-standing problems of vacuum electronics are not insurmountable. If the distance between cathode and anode were less than the average distance an electron travels before hitting a gas molecule, a distance known as the mean free path, and the working voltage is low enough, the device can operate just fine at atmospheric pressure. That is, you do not, in fact, need to maintain any sort of vacuum at all for what is nominally a miniaturized piece of vacuum electronics.

Questions

1. What is the main idea of the above passage?

- 1) Main problems of vacuum electronics.
- 2) Solutions for drawbacks of vacuum tubes.
- 3) Vacuum-tube technology and its applications.
- 4) Combination of an extinct device with a new technology.

2. Which of the following is NOT stated in the passage as a vacuum tube problem?

- 1) Low longevity
- 2) Long setup time
- 3) High fabrication cost
- 4) Low energy efficiency

3. In a vacuum-channel transistor, electrons are drawn from the source by a process called...

- 1) Field emission**
- 2) Power-sapping**
- 3) Mean free path**
- 4) Nano meter-scale protrusions**

4. The pronoun "it" in the second paragraph refers to...

- 1) Tube**
- 2) Cathode**
- 3) Residual gas**
- 4) Electric field**

5.The word “insurmountable” in the last paragraph is closest in meaning to...

- 1) Unsolvable**
- 2) Inaccessible**
- 3) Invaluable**
- 4) Unpredictable**

6.The word “drawbacks” in the first paragraph cannot be replaced by...

- 1) Benefits**
- 2) Problems**
- 3) Impairments**
- 4) Adverse aspects**

Answers

1==> 1

2==> 3

3==> 1

4==> 4

5==> 1

6==> 1