**Срок сдачи 19 декабря**

**ТЕХТ: MODE OF OPERATION OF TRIODES**

1. Now a voltage has been applied to the heater and the cathode is emitting a normal supply of electrons. The plate is at a high positive potential and would normally attract a large number of electrons from the space charge, if it were not for the large negative bias voltage applied to the grid from the Egg battery.1

2. Because of this large negative potential, the electrostatic field normally existing between plate and cathode cannot penetrate to the cathode and actually terminates on the grid wires. Under these conditions the grid entirely neutralizes the electrostatic field and, hence, the attraction of the plate. Since there is no electrostatic field near the cathode to draw away the electrons, the plate current through the tube is zero and a large space charge accumulates in the region between cathode and grid. The smallest negative voltage between grid and cathode that is just capable of cutting off the plate current is called the cut-off bias.2

3. Consider now that everything has been left unchanged, except that the negative bias voltage has been reduced to a value less than cut-off. The grid is now no longer capable of neutralizing the field between plate and cathode completely and some of the lines of force penetrate between the grid wires to the cathode. Consequently, some electrons are attracted away from the space charge and move between the grid wires towards the positive plate.

4. This results in a moderate flow of plate current. As the negative grid voltage is further reduced, that is, made less negative, progressively more electrons are able to pass between the grid wires to the plate and the plate current continues to increase.

5. When the bias voltage is removed and the grid voltage is zero, the positive voltage on the plate produces a substantial electric field at the cathode and large numbers of electrons are attracted through the grid wires to the plate, resulting in a fairly large plate current. The action is similar to that of a diode, except that the grid still has some retarding effect on the electrons because of its shielding action, and hence the plate current is somewhat less than it would be with the grid removed entirely.

6. When the bias voltage has been reversed in polarity, the grid is being made positive with respect to the cathode. The grid potential now aids the plate voltage and produces a very strong electrostatic field at the cathode, resulting in a large plate-current flow through the tube. If the grid is made sufficiently positive with respect to the cathode, a point will be reachеd when the electrons are attracted to the plate as fast as they can be emitted from the cathode. No space charge can accumulate under these conditions and the plate current reaches its saturation value. Still further increases in either the grid or the plate voltage cannot cause an increase in the plate current.

7. A part of the electrons is attracted to the positive grid and causes a grid current to flow between grid and cathode. Under these conditions power is dissipated in the grid circuit. To avoid this power consumption and also the large saturation plate current, which eventually can damage the tube, electron tubes are generally operated at negative grid potentials with respect to the cathode.

1. **Make up an abstract of the text basing on the answers to the review questions:**

***Review questions***:1. Why is the plate current zero through the tube? 2. What is the cut-off bias? 3. When does the plate current continue to increase? 4. When does a large plate-current flow through the tube take place? 5. When does the plate current reach its saturation value? 6. Under what conditions is power dissipated in the grid circuit? 7. Why are generally electron tubes operated at negative grid potentials with respect to the cathode?

1. **Test 1.** **Find the correct answer out of the three given to each question**:
2. Which of the following tubes consists of three elements:

a diode tube, a triode tube, a pentode tube

1. Which of the following elements has a controlling effect on the flow of plate current:

a cathode, a plate, a grid

1. Which of the following elements is connected with a high positive voltage:

a plate, a cathode, a grid

1. Which of the following elements is connected with a low negative voltage:

a grid, a cathode, a plate

1. Which of the following voltages is an alternating voltage:

a bias voltage, a signal voltage, a plate battery voltage

**Test 2. Find Russian equivalents for the English verbs:**

1. consist of (a) требовать
2. vary (b) состоять из
3. govern (c) усиливать
4. amplify (d) приводить к
5. add (e) работать
6. provide (f) называть
7. operate (g) обеспечивать
8. call (h) прибавлять
9. require (i) управлять
10. result in (j) изменяться

**Test 3. Find a synonym (a), (b), (c) or (d) to the word or word combination in bold type**:

1. The voltage **placed** on the grid — (a) measured; (b) changed; (c) Increased; (d) put
2. The great **quantity**— (a) space; (b) area; (c) amount; (d) part
3. To **aid** the plate voltage — (a) change; (b) help; vary; (d) cause
4. The **different** voltage — (a) various; (b) suitable; (c) similar; (d) same
5. A **suitable** instrument — (a) new; (b) rare; (c) pro­per; (d) given
6. **In addition to** this fact — (a) therefore; (b) besides; (c) instead of; (d) in spite of
7. To differ **rarely**from — (a) completely; (b) entirely; (c) slightly; (d) seldom
8. To **explore** a problem — (a) know; (b) discuss; (c) speak about; (d) research
9. To **obtain** positive charges — (a) produce; (b) attract; (c) acquire; (d) keep
10. **To give rise to** electrization — (a) use; (b) cause; (c) increase; (d) decrease
11. The electrons **can** pass through — (a) must; (b) should; (c) are able to; (d) will
12. **To present** a picture — (a) draw; (b) see; (c) discuss; (d) represent
13. The **form** of the tube — (a) size; (b) shape; (c) quality; (d) kind
14. To **damage** a device — (a) repair; (b) manufacture; (c) construct; (d) break
15. To **remove** the grid — (a) add; (b) maker (c) draw away; (d) place
16. To **manufacture** the electron tubes — (a) construct; (b) repair; (c) use; (d) produce
17. To **control** the flow of current — (a) regulate; (b) vary; (c) stop; (d) produce
18. To **ascertain** the voltage — (a) amplify; (b) determine; (c) change; (d) measure
19. To be **closer** to the grid — (a) nearer; (b) far from; (c) within; (d) away from
20. To **cut**the lines of force — (a) fix; (b) intersect; (c) represent; (d) change

**Test 4. Finish each sentence choosing one of the three variants (a), (b) or (c)**:

1. A triode has...

(а) one element; (b) two elements; (c) three elements.

1. A triode consists of...

(а) the control grid and the plate; (b) the cathode alone; (c) the cathode, the plate and the control grid.

1. The control grid is...

(а) between the cathode and the plate; (b) behind the plate of the diode; (c) behind the cathode of the diode.

1. A vacuum triode is...

(а) a more simple device than a vacuum diode; (b) a more complicated device than a vacuum diode; (c) similar to a vacuum diode.

1. When a voltage is placed on the grid it has a profound effcct on...

(а) the electric field between cathode and plate; (b) the form of the plate current; (c) the form of the plate voltage.

1. The plate of the tube is normally connected to...

(а) a low positive voltage; (b) a high positive voltage; (c) a negative voltage.

1. The heater is connected to...

(а) a relatively low voltage; (b) the highest voltage; (с) the source' of the plate voltage.

1. The plate of the tube is connected to a high positive voltage...

(а) to repel the stream of electrons; (b) to attract the stream of electrons; (c) to cut off the stream of electrons.

1. A relatively low voltage ac or dc is connected to the heater...

(а) to produce a supply of electrons;'(b) to create a supply of positive charges; (c) to govern the flow of plate current.

1. A voltage is placed on the control grid...

(а) to create a supply of electrons; (b) to heat a cathode; (c) to govern the flow of plate current.

1. One of the components is a fixed dc voltage, called...

(а) the signal voltage; (b) the bias; (c) the transient voltage.

1. The purpose of the bias voltage is...

(а) to vary the flow of plate current; (b) to govern the electric field; (c) to bias the grid of the tube.

1. Superimposed upon the bias voltage is a voltage usually called...

(а) the signal voltage; (b) the bias; (c) a fixed dc voltage.

1. A small variation of the signal voltage on the grid...

(а) results in a large variation of the plate current through the tube; (b) has no influence at all on the plate current; (c) results in a small variation of the plate current through the tube.

1. The smallest negative voltage between the grid and the cathode capable of cutting off the plate current is called...

(а) the plate voltage; (b) the cut-off bias; (c) the zero grid bias.

1. The plate current is measured by...

(а) a wattmeter; (b) a voltmeter; (c) a milliamperemeter.

1. A tiny change in the grid voltage can cause...

(а) no change in the plate current; (b) the rectifying of the electric current; (c) a large change in the plate current.

1. The signal voltage appearing at the grid...

(а) is not changed; (b) is amplified in the plate circuit of the tube; (c) is rectified in the plate circuit of the tube.

1. The function relations between plate voltage, grid voltage, and plate current are called...

(а) a family of triode characteristic curves; (b) the diode characteristic curves; (c) the single characteristic curve.

1. Static characteristics are obtained...

(a) under actual operating conditions; (b) when steady dс voltages are applied to the tube's electrodes; (c) when varying voltages are applied to the tube's electrodes.