

COLLEGE OF ENGINEERING, DESIGN, ART AND TECHNOLOGY SCHOOL OF ENGINEERING DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

COMP1101: ELECTRONICS I – CONTINOUS ASSESSMENT TEST 1
WEDNESDAY, OCTOBER 11TH, 2017
TIME: 1 HOUR, 30 MINUTES

INSTRUCTIONS:

- 1. Answer all questions.
- 2. All multiple-choice questions carry equal points.
- 3. Select the response(s) that most accurately answer the question.
- 4. Multiple selections of responses of which one may be incorrect lead to the loss of all points.
- 5. You are allowed 1 page of formulas for your cheat sheet.

SECTION A

- 1. By the mid 20th century, electronic equipment was mostly based on
 - a) A minute arrangement of electronics to provide the vacuum tube functionality.
 - b) Vacuum tubes.
 - c) A cascaded arrangement of electronics to supplement the vacuum tubes.
 - d) All of the above
- 2. Conduction in elements is driven by
 - a) The number of neutrons in the atom.
 - b) The number of protons and electrons in the atom.
 - c) The number of electrons in the valence shell of the atom.
 - d) All the above.
- 3. One of the main disadvantages of the use of vacuum tubes is that they are
 - a) Too silent.

c) Bulky

b) Too silent and bulky.

- d) Very large life time
- 4. With the invention of a germanium transistor in Bell Labs,
 - a) The disadvantages of the vacuum tube were overcome.
 - b) The advantages of the vacuum tube were combined into the functionality of the transistor.
 - c) The temperature performance of vacuum tubes was increased.
 - d) None of the above

5. Elements in nature

- a) Possess a certain number of neutrons equal to the number of protons.
- b) Possess a certain number of protons that determine the charge on the element.
- c) Possess a certain number of protons and an equal number of electrons.
- d) None of the above.

6. The electrical resistance of metals can be

- a) Largely changed by slight changes in temperature
- b) Largely changed by large changes in temperature
- c) Slightly changed by changes in temperature and humidity
- d) Slightly changed by changes in temperature

7. The electrons of an element are

- a) Organized around the neutrons in shells.
- b) Organized around the nucleus in shells.
- c) Organized around the protons in shells
- d) Organized in the outer most shell

8. Conduction in insulators is

- a) By the motion of ions.
- b) By the motion of electrons and holes.
- c) By the motion of electrons.
- d) None of the above.

9. The conductivity of various materials is different because

- a) The number of free carriers in materials varies widely.
- b) Electrons are heavier than holes and thus take longer to travel.
- c) Both of the above

d) None of the above

10. Conduction in semiconductor devices is through

- a) The combined movement of holes and electrons in one direction.
- b) The movement of ions from the depletion zone.
- c) The movement of holes and electrons in opposite directions
- d) The movement of holes only in a p-type and electrons only in the n-type

11. Semiconductor devices can be accurately describe as

- e) Being both a conductor and an insulator.
- f) Being neither a conductor nor an insulator.
- g) Being either a conductor or an insulator.
- h) All the above.

- 12. It is possible to determine the total width of the depletion region at equilibrium if
 - a) The concentration of the electrons and holes in the material are known.
 - b) The concentrations of all energized elements in the material are known.
 - c) The weight of the donor and acceptor atoms measured before using them.
 - d) The concentrations of the donor and acceptor atoms are known.

13. In a p-n junction diode,

- a) The anode and cathode for the negative terminal.
- b) The anode and the cathode form the positive terminal.
- c) The anode has positive potential while the cathode has negative potential.
- d) The anode has negative potential while the cathode has positive potential.

14. In forward-biasing a p-n junction

- a) The p-type material is connected to the positive terminal of the voltage source.
- b) The n-type material is connected to the positive terminal of the voltage source.
- c) The user determines the arrangement and connection of the voltage source.
- d) All of the above.

15. Based on the Shockley ideal diode equation approximation,

- a) The reverse bias diode current is equal to the saturation current.
- b) The forward bias diode current is equation to the reverse bias current.
- c) All currents in any condition of the diode are equal.
- d) All of the above.

16. One of the problems of scientific management was that

- a) Managers often focused on worker motivation
- b) The workers increasingly demanded more motivation
- c) Workers could purposely underperform.
- d) Workers over performed and thus deserved increased motivation.

17. The electric field in the zero bias state of a p-n junction is:

- a) In opposition to the space charge region.
- b) Created by the space charge region
- c) Accelerates the diffusion of holes and electrons across the junction.
- d) All of the above.

18. In the p-n junction depletion region at equilibrium:

- a) The space charge region is almost completely depleted of majority carriers.
- b) The region has the same magnitude of charge on both sides of the junciton.
- c) The negative ions overpower the positive ions
- d) All of the above.

- 19. For semiconductor devices, lifetime is defined as
 - a) The average amount of time of recombination.
 - b) The average amount of time of creation of holes and electrons.
 - c) The average amount of time of the creation and recombination of a free electron and hole.
 - d) All the above

20. Thermal ionization is when

- a) A fall in temperature results in thermal motion of the atoms.
- b) A fall in temperature results in the thermal motion of electrons
- c) A rise in temperature results in thermal motion of the atoms.
- d) A rise in temperature results in the thermal motion of electrons

SECTION B:

Semiconductor devices are widely used in electronic circuits today. One of the popular applications of semiconductor devices is through p-n junctions.

- a) Discuss, with appropriate illustrations, the functionality of p-n junctions in the presence or absence of a connected voltage source.
- b) What is a p-n junction diode and how does its functionality in electronic circuits compare with that of resistors.
- c) In analyzing the operation of diodes circuits, 2 methods find wide application. Discuss and contrast each of the diode analysis methods.